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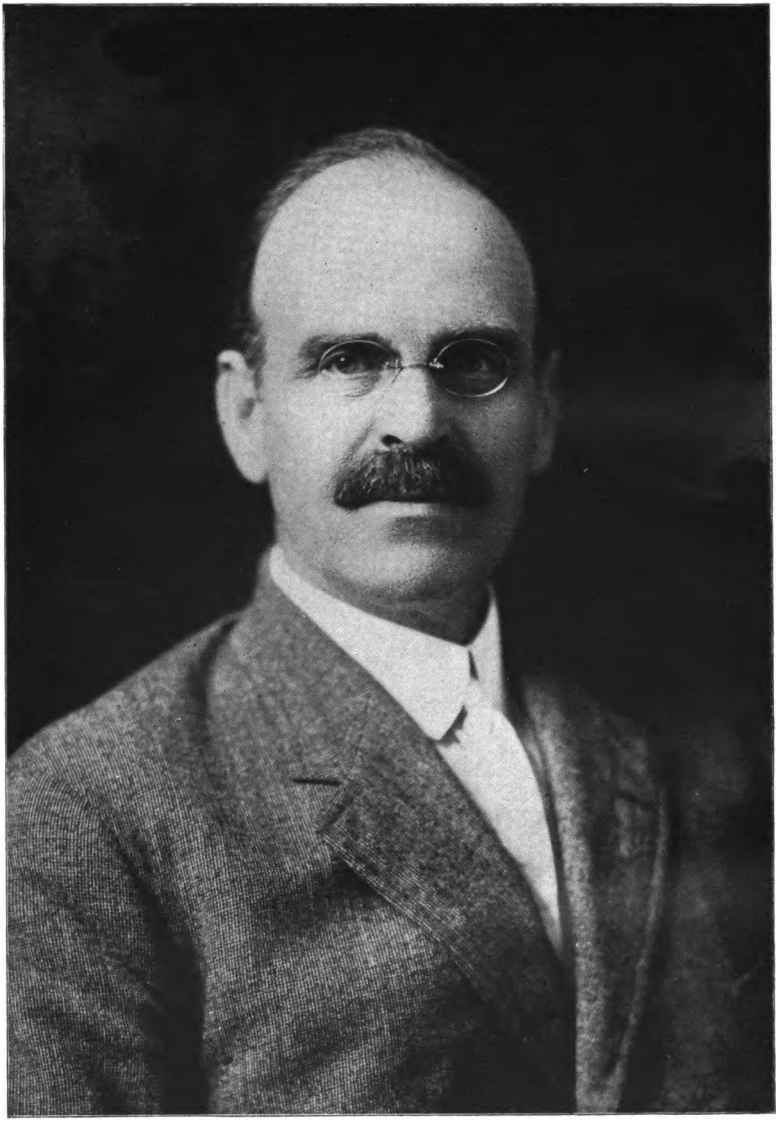

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PROCEEDINGS

Natural Conservation of Alaska

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May [illegible], 1910

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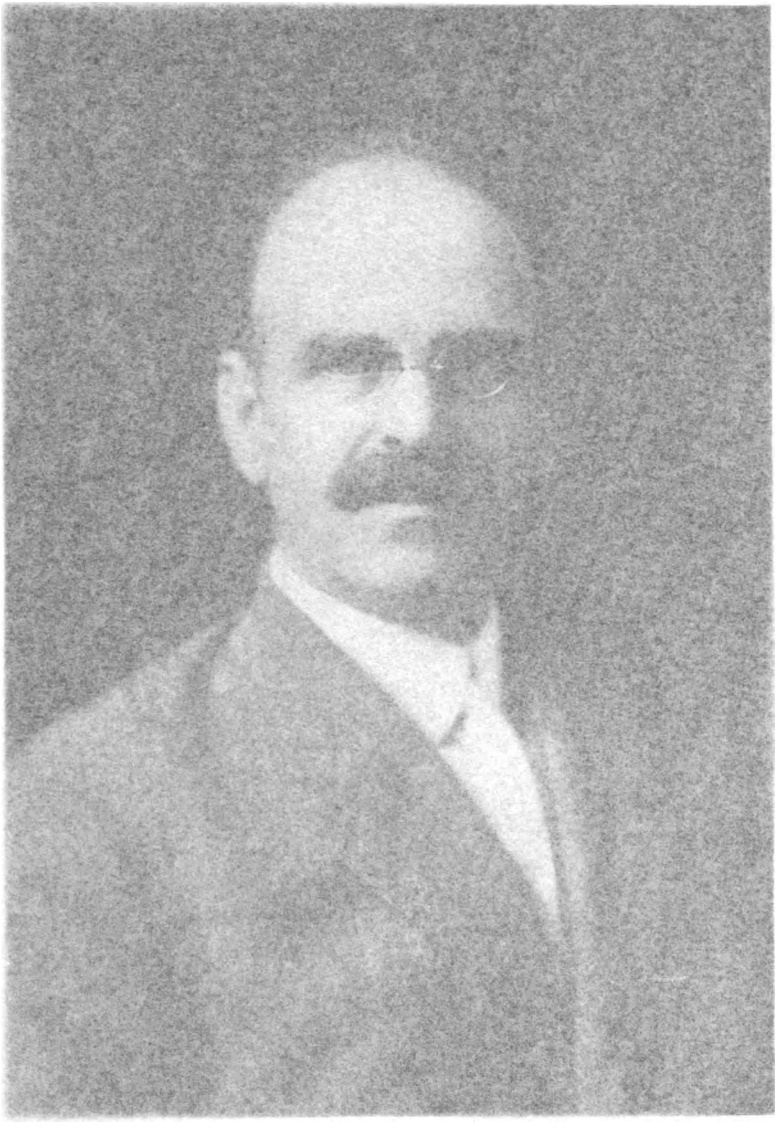

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PROCEEDINGS

OF THE

Natural Gas Association of America

FIFTH ANNUAL MEETING

HELD AT

THE LEE-HUCKINS HOTEL
OKLAHOMA CITY,
OKLAHOMA

May 17th, 18th and 19th, 1910.

PUBLISHED BY THE ASSOCIATION
EDITED BY THE SECRETARY

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KERR M. MITCHELL,
Director.

WILLIAM M. WELCH,
Director.

JOHN M. GARARD,
Vice President.

PRESTON W. LUPHER,
Director.

JAMES P. STRICKLER,
Director.

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FIFTH ANNUAL MEETING

OF THE

Natural Gas Association of America

HELD

MAY 17th, 18th and 19th, 1920

PROCEEDINGS.

FIRST DAY—TUESDAY.

The Fifth Annual Meeting of the Natural Gas Association of America convened in the Convention Hall of the Coates House, Kansas City, Missouri, at 10:30 o'clock A. M. on Tuesday, May 18th, 1920, President Humphrey Gas Co., of Kansas City, Kansas, and Thomas Clyde Jones, of Delaware, Ohio, as secretary pro tem. The following members reported their attendance:

[illegible]	BALLIN, A. E.
[illegible]	BARNES, FRANK.
[illegible]	BARNES, GEORGE W.
[illegible]	[illegible]R, S. H.
[illegible]	[illegible]LEY, E. L.
[illegible]	[illegible]H, E. C.
[illegible]	[illegible]NDT, LOUIS.

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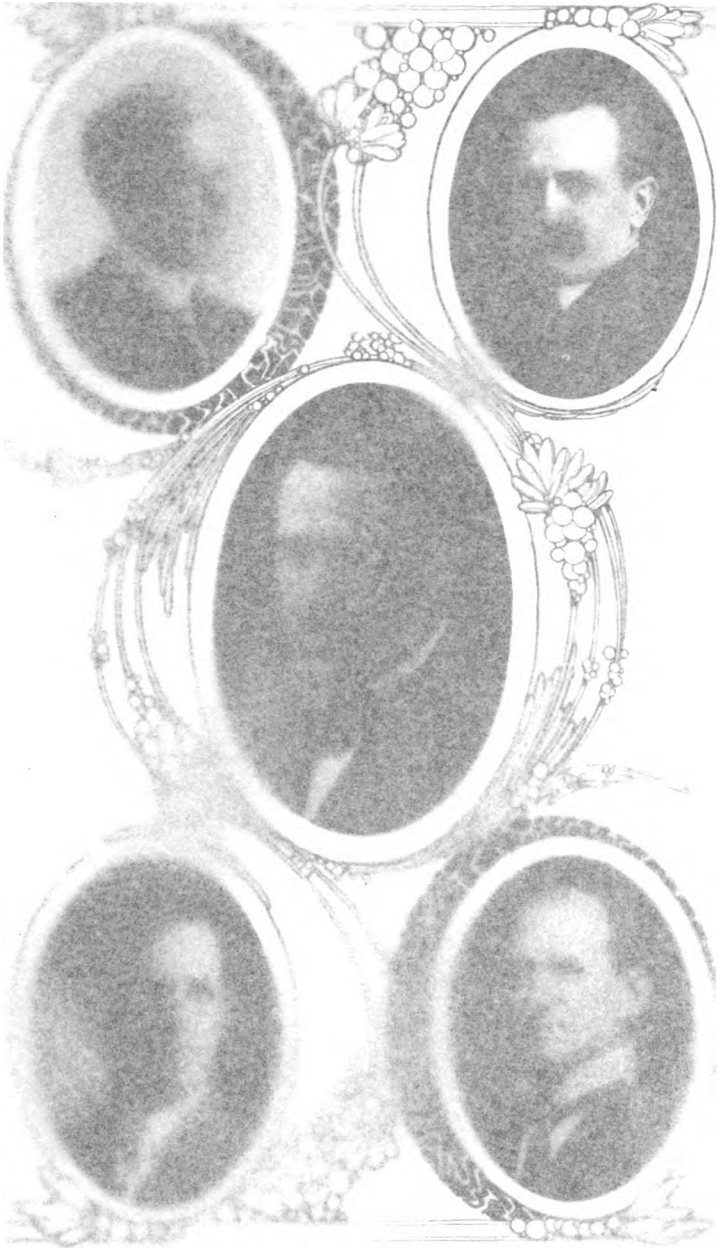

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FIFTH ANNUAL MEETING

OF THE

Natural Gas Association of America

HELD

MAY 17th, 18th and 19th, 1910.

PROCEEDINGS.

FIRST DAY — TUESDAY, MAY 17.

The Fifth Annual Meeting of The Natural Gas Association of America convened at the Lee-Huckins Hotel, Oklahoma City, Oklahoma, at 9:30 o'clock A. M., May 17, 1910, with William Hunter McKenzie, of Kansas City, Kansas, as president, and Thomas Clive Jones, of Delaware, Ohio, as secretary. The following members reported their attendance:

ALLEN, J. F.
ALLEN, S. S., JR.
ALMERT, H.
ARDIS, J. B.
ATHERTON, S. R.
BAKER, E. L.
BALLARD, CHARLES R.
BALLIN, A. E.
BARNES, FRANK.
BARNES, GEORGE W.
BARR, S. H.
BARTLEY, E. L.
BEACH, E. C.
BENDIT, LOUIS.

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Bennett, J. G.
Bigelow, Lucius Seymour.
Billmek, H. B.
Bishop, H. W., Jr.
Bishop, Max Miller.
Bixby, W. A.
Booth, Arthur.
Boothe, George P.
Braden, G. T.
Brake, J. A.
Branch, Harry.
Brawley, Hugh P.
Brendlinger, W. B.
Brummett, J. R.
Bullock, C. L.
Cantrell, C. C.
Carey, Joseph.
Carmody, M. B.
Carpenter, J. F.
Carter, J. H.
Cavenaugh, F.
Cody, A. S.
Cole, T. F.
Connolly, J. S.
Corbett, M. A.
Coyle, F. J.
Cozzins, L. E.
Crahan, B. J.
Craig, C. B.
Curtis, A. G.
Dague, A. B. C.
Dana, J. W.
Davis, H. R.
Dawes, Henry M.
Diamond, J. H.
Dibbens, W. J.
Diescher, Alfred J.
Dings, P. C.
Eakin, R. E.
Emington, P. J.
Evans, George W.
Ewing, A. M.
Finney, Frank F.
Fisher, Jas. P.
Fithian, E. J.
Foshay, W. B.
Fowks, William.
Freeman, J. W.
Fritz, R. O.
Gage, W. P.
Garard, John M.
Gavin, Thomas.
Gibson, W. C.
Gillespie, E. A.
Goodrich, H. B.
Grear, W. S.
Greenert, John A.
Gunn, W. A.
Gwynn, E. F.
Hackstaff, John D.
Hackstaff, Richard C.
Hammon, William H.
Hampton, Wade, Jr.
Hardcastle, J. D.
Hartzell, A. C.
Hastings, D.
Hay, Ralph W.
Hays, Victor A.
Henry, W. C., Jr.
Hitchcock, Otto G.
Hoagland, H. C.
Holbrook, David O.
Holmes, A. G.
Holt, W. T.

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Hoyt, H. J.
Hunter, S. S.
Jarvis, T. B.
Johnson, A. B.
Johnson, Paul R.
Jones, W. H.
Jones, Thomas Clive.
Keeton, C. G.
Kelley, Henry E.
King, I. W.
LaDow, C. V.
Leamy, Alan.
Leanord, A. M.
LeFevre, Harry E.
Lambert, E. J.
Larkin, J. J.
Lemon, C. W.
Lord, R. S.
Lufkin, E. C.
Macbeth, A. B.
McIlhenny, John D.
McIlvain, R. W.
McKenzie, William H.
McLane, O. J.
McLaughlin, H.
Marcus, O. G. F.
Mason, Alphonso.
Mason, C. F.
Mettler, Lee B.
Mann, John L.
Miller, Fred A.
Miller, H. R. P.
Mitchell, Kerr M.
Moeller, William, Jr.
Molloy, D. D.
Moore, Edgar M.
Morris, H. C.
Moss, C. E.
Mueller, Fred B.
Neely, F. M.
Nicholson, W. H.
Nilson, Harry C.
O'Neill, William D.
Owens, J. F.
Parker, John F.
Posgate, James S.
Pratt, J. W.
Raber, H. W.
Ransom, J. H.
Rhea, E. B.
Robinson, Foster.
Robinson, Geo. R.
Robinson, Geo. W.
Schall, Henry D.
Schell, George W.
Sears, Clifton W.
Seeger, Robert.
Seidenglanz, C. H.
Shannon, O. K.
Shreve, J. H.
Shryock, George A.
Sipe, George B.
Small, H. G.
Sprague, H. H.
Stanford, G. T.
Stevenson, Barton.
Stone, F. W.
Storm, J. C.
Strickler, James P.
Strickler, W. W.
Stuchell, F. L.
Sybrandt, John L.
Sweetman, M. M.
Swift, Justin R.

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TADBALL, J. W.
TIDNAM, F. H.
TIPPY, C. W.
TEWKSBURY, J. B.
TOWNSEND, W. CHARLES.
TRELEAVEN, L. G.
VANBLARCOM, HOWELL.
VANSICKEL, CHARLES.
VANSICKEL, WALTER S.
WALKER, ELLIS.
WALLACE, R. D.
WALSH, M. W.
WELCH, WILLIAM M.
WEISGERBER, E. C.
WESTCOTT, H. P.
WHITEHEAD, L. K.
WILLEY, C. L.
WILLOUGHBY, HORACE.
WITMAN, W. S.
WITTMER, GEORGE X.
WITTMER, THOMAS.
WITTMER, XAVIER.
WOOD, W. L., JR.
WORTH, S. S.

PRESIDENT MCKENZIE: Gentlemen, we will now consider the Fifth Annual meeting of The Natural Gas Association of America in session and ready for business. Our first feature will be an address of welcome from Mayor Henry M. Scales, of Oklahoma City. (Applause).

ADDRESS OF WELCOME.

HONORABLE HENRY M. SCALES.

MR. PRESIDENT AND GENTLEMEN: It certainly affords me a great deal of pleasure to have the privilege of standing here this morning and, in behalf of my city and as its chief executive, to try, in a very feeble and halting way, to extend to you a few words of really genuine, hearty welcome into this the newest city and, in some respects, the most wonderful town in the United States. Unfortunately, your speaker is suffering with a physical infirmity that makes articulation extremely difficult, which causes my words to halt and probably not to be thoroughly understood, but, out of the fullness of my heart, I yet hope to be able to say something that may assure you of the fact that we appreciate your presence here on the plains of Oklahoma, this, the 17th day of May, 1910. Our hearts were filled with both pleasure and pride when last year the news came flashing over the wire, from Columbus, O., that this city had been chosen as the next Mecca in which this representative body of men would

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gather. Being the largest city within the new State, it naturally follows that many conventions or gatherings take place within our confines. So much has that been true in the past, in a small way at least, we are recognized as the convention city of Oklahoma. I seriously question if ever this city has had the privilege of entertaining in convention a body of men, because of the line of business they are in, so significant as this gathering. The natural gas industry is so fundamentally connected with progress, with building, with expansion, with growth, with those material things that go to make up the possibilities of a city, that we recognize and realize that in you and through you and by you, the wheels are made to turn, the factories are made to multiply, that products are made to come forth, that wealth is increased, that cities are builded. We are not unmindful nor unappreciative of the fact that through the gas company of this city what we have already done has been made possible, and we know that what has been accomplished is only an earnest of those things that are yet to be accomplished, or made possible, by reason of the fact that we are of the few cities with the proud privilege of having a natural gas supply. Time was, to digress but a moment, when it was necessary for cities to wall themselves in with strong and impregnable fortresses. At that time it was also necessary that gates guard the city, and that only those to whom the keys were given were allowed to come and go at their liberty and at their will. It is a very far cry from walled cities to building a town like this; but it was the custom then, when any visitors did come into the midst of another city, that the keys of the city should be literally handed to them as indicative of the fact that they were friends and had the right to come and go at their pleasure. Because of that historic fact, it has become a custom that, when conventions do come, keys are, at least figuratively, offered. Carrying out that idea, which is really a beautiful one in sentiment, I have the pleasure on this occasion to turn over, not only figuratively but literally, the key of our city, Mr. President, to the Natural Gas Association of America, and all we ask is that you may leave the town approximately in the same condition in which you found it, because some of us may have use for it next week.

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(Prolonged applause). Besides that, you are more than welcome. We appreciate your presence. We are glad to look into your eyes and to strike hands with you, to know you, to understand you, because we believe if we succeed in making a favorable impression upon this body of men that, when you go back to your respective homes, you will not fail to mention our town to others and thereby assist in giving to us that publicity which has builded us to our present point; and we are not figuring, gentlemen, on stopping anywhere short of 200,000 or 300,000 people. Therefore, we want your assistance, your co-operation, your friendship. Again, on behalf of the city, I welcome you in our midst. (Applause).

Thereupon, the Mayor, suiting the action to the word, "literally, not figuratively," presented to the President a large and perfectly burnished key, incased in a handsome leather case lined with silk.

PRESIDENT MCKENZIE: We have with us today Mr. John M. Garard, who is here to tell the Mayor of Oklahoma City and the people of Oklahoma how glad we are to be in their midst.

RESPONSE.

JOHN M. GARARD.

Mr. President, His Honor the Mayor, and Gentlemen of the Convention:

The Mayor said he was going to do his part in a weak way. I am sorry he didn't wait until I got through. But to me has been assigned one of the most pleasant duties of our present meeting, that of accepting, on behalf of the Natural Gas Association of America, the key to the Sunbeam city of the great Southwest. When a letter from His Honor, the Mayor of Oklahoma City, was read in our convention hall at Columbus, Ohio, at our last annual meeting of this Association, it was unanimously decided that we not only wanted to meet that Mayor, but we wanted to meet the people whom he represented, and, while other cities were mentioned as the next meeting place, their claims were not considered; and since that time our great-

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est efforts have been put forth to make the Natural Gas convention at Oklahoma City the greatest in the history of the Association, and from present indications we are about to realize our fondest expectations, for at no time have the members shown such profound interest in a meeting as they have in this one. And right here I want to say that our President and Secretary should be given great credit for bringing about present conditions.

And now to the honorable gentlemen who have so kindly opened the portals of this City Beautiful to the members of the Natural Gas Association, in behalf of its members I beg to thank you for your generous welcome, and in return for your kind hospitality I promise that the golden key to your charming homes will be taken with us at the close of this meeting without one spot on its polished surface, and I am sure at no time in the future will the residents of Oklahoma City have cause to regret that they entertained the members of the Natural Gas Association of America on this their fifth annual meeting.

It is hard to realize that you have just attained your majority, for you have certainly built far beyond your years, and it is not my intention to take from you one particle of credit for what you have done in the way of building the many beautiful homes and magnificent business blocks, but the Supreme Being was certainly kind to you when He furnished the foundation and surrounded them with a Garden of Eden. I thank you very much, gentlemen. (Applause).

PRESIDENT MCKENZIE: The next order of business is the reading of the minutes of the last meeting.

MR. M. M. SWEETMAN: Before you go into the general business of the meeting and take up the reading of papers and reading of the minutes, I want to call attention to the death of one of our esteemed members since the last meeting, Mr. James B. McGowan, of Kansas City, and, if you will permit me, I would like to offer a resolution.

PRESIDENT MCKENZIE: Certainly; proceed.

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MR. SWEETMAN:

IN MEMORIAM.

WHEREAS, Since the last annual meeting of this Association, death has removed from our roll the name of one of our most esteemed members, Mr. James B. McGowan, of Kansas City, Missouri; and,

WHEREAS, His fellow members of the Natural Gas Association of America desire to record their appreciation of the high character of their late associate and to express their regret concerning his demise; Be it therefore,

Resolved, That the decease of Mr. McGowan deprives this organization of one of its most valued members. Always deeply interested in the proceedings of our convention, and by his modesty, his geniality and his unvarying courtesy, he gained the friendship of every member of this body, whose intercourse with him is pleasantly remembered. The feelings of regret which his demise occasions us, are united with our sympathies for his widow and relatives, who are bereft of a kind and affectionate husband and friend, while the community of Kansas City suffers the loss of one of its best and most useful citizens.

Resolved, That these resolutions be spread on the minutes, and that a copy be sent to the family of the deceased.

PRESIDENT MCKENZIE: I move that we adopt the resolution by a standing vote.

PRESIDENT MCKENZIE: Gentlemen, you have heard the motion. All in favor please rise.

Every delegate arose and remained standing, with bowed head, while the president declared the motion unanimously carried and directed the Secretary to forward to the widow of the deceased member a copy of the resolutions.

PRESIDENT MCKENZIE: Now we will proceed, as I have said, with the reading of the minutes of the last meeting.

L. S. BIGELOW: I move you, Mr. President, that the reading of the minutes of the last meeting be dispensed with as they have already been published.

The motion was duly seconded, by several delegates, put and unanimously carried.

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PRESIDENT MCKENZIE: The next order of business is the report of the Board of Directors.

The Secretary then read the report of the Board of Directors, as follows:

REPORT OF BOARD OF DIRECTORS.

OKLAHOMA CITY, May 16, 1910.

To the Natural Gas Association of America:

GENTLEMEN: Your Board of Directors begs leave to submit for your consideration the following recommendations and report:

Membership Committee: James P. Strickler, K. M. Mitchell, W. M. Welch.

Auditing Committee: John M. Garard, K. M. Mitchell, W. M. Welch.

Nominating Committee; John F. Parker, M. W. Walsh, K. M. Mitchell.

Committee on Next Place of Meeting: D. O. Holbrook, A. B. Macbeth, H. P. Brawley.

Committee on Final Resolutions: L. S. Bigelow, Alan Leamy, C. W. Sears.

That C. T. Chisholm, R. C. Cornish, W. P. Benedict, Lee H. Wilson, S. S. Stratton, J. L. Maloney, M. H. Gascoigne, J. W. Freeman, B. L. Love, W. A. Lapham, Isidor Ruah, E. H. Becker and C. H. Apple be released from membership, at their own request.

That M. D. Brady, A. M. Ewing, S. W. Hilt, R. E. Joyce, C. E. Moss, E. S. Miller and H. M. Seigfreid be dropped from membership for non-payment of dues.

That the thirty-seven Associate Members elected at the Fourth Annual Meeting, be placed in the Active Class Membership.

That the following changes be made in the Constitution and By-Laws:

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AMENDMENTS TO THE CONSTITUTION.

That Article 4 Section 2 be amended to read as follows: The Board of Directors shall consist of the President, the Vice-President, the Secretary-Treasurer and four Active Members of the Association, two (2) of whom shall be elected at each annual meeting and whose term of office shall be for two (2) years.

That Article 3 Sections 1, 2 and 3 be amended to read as follows:

SECTION 1. The membership of the Association shall consist of Honorary, Active and Junior Members, and Junior Members shall not be entitled to vote nor hold office, but shall be entitled to all the other privileges of membership.

SEC. 2. Honorary members shall be gentlemen whose scientific or practical knowledge in matters relating to the gas industry, and whose efforts and interest in behalf of said industry shall recommend them to the Association.

SEC. 3. To be eligible for Active Membership, a person must be an officer or employe of a gas company, or be engaged in an occupation identifying him with the gas industry, or be otherwise qualified to assist in promoting the objects of the Association.

SEC. 4. To be eligible to Junior membership, a person directly or indirectly connected with the gas industry, or may be skilled therein. Junior members shall have all the privileges and courtesies of the Association, except the right to vote or hold office. Junior Members may be transferred to Active Membership by a vote of the Association upon recommendation of the Board of Directors.

SEC. 5. Honorary members shall be proposed by the Board of Directors, at a general meeting of the Association.

AMENDMENT TO THE BY-LAWS.

That Article 3 Section 1 be amended to read as follows: The fees for Active Membership shall be five ($5.00) dollars, which shall include dues for the first year, and the yearly dues shall be five ($5.00) dollars, payable in advance thereafter. The fees for Junior Membership shall be three ($3.00), which shall include dues for the first year, and the yearly dues shall be three ($3.00), payable in advance thereafter.

Respectfully submitted for the Board of Directors.

W. H. MCKENZIE, *President,*
T. C. JONES, *Secretary.*

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SECRETARY JONES: I move, Mr. President, the adoption of the report.

Several members seconded the motion.

MR. M. M. SWEETMAN: I would like to ask a question. That means, does it, that Junior members hereafter shall not be entitled to election as Active Members?

SECRETARY JONES: Why, Mr. Sweetman, the Junior Members remain as they are. It simply is allowing the Associate Members to come in as Active Members. Heretofore, it has been the custom to elect the Associate Members Active Members a year after they have been in. The Junior Members stay just as they are.

MR. M. M. SWEETMAN: It doesn't affect those who have been elected heretofore?

SECRETARY JONES: Oh no.

Thereupon, the motion to adopt the report of the Board of Directors was put and unanimously carried.

PRESIDENT MCKENZIE: The report of the Secretary-Treasurer is the next order of business.

MR. M. M. SWEETMAN: Just a minute. Will it be necessary to adopt the report of the Board? Because that must be laid over until next year again to be acted upon.

SECRETARY JONES: It is just read now, and then it is adopted a year from now.

MR. M. M. SWEETMAN: Then it is not adopted now, but just the report of the Board is adopted?

PRESIDENT MCKENZIE: That is all. It is to be acted on at the next meeting.

The Secretary-Treasurer then submitted the following:

REPORT OF THE SECRETARY AND TREASURER.

To the National Gas Association of America:

GENTLEMEN: I have the honor to present herewith the Annual Report of the Secretary and Treasurer for the period between May 17, 1909, and May 1, 1910.

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MEMBERSHIP REPORT.

Honorary Members—		
As per membership rolls May 19, 1908		2
Elected May 18, 1909		2
Total		4
Active Members—		
As per membership rolls May 19, 1908		202
Transferred from Associate May 18, 1909		19
Elected May 18, 1909		103
Total		324
Resigned May 18, 1909	6	
Died during the year	3	9
Total		315
Associate members.		
Elected May 18, 1909		37
Total		37
Junior Members—		
As per membership rolls May 19, 1908		23
Total		23
Total membership this date		379

FINANCIAL REPORT.

RECEIPTS.

Balance, May 18, 1909	$ 390.00
Dues	968.00
Initiation fees	650.00
Sale of proceedings	30.00
Advertising	675.00
Gas journals, report Fourth Annual Meeting	45.00
J. F. Owens, Secretary	429.25
Total	3187.25

EXPENDITURES.

Printing and stationery	$1438.74
Reporting, Fourth Annual Meeting	120.00
T. C. Jones, compensation as Acting Secretary	150.00

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Postage, Express and General Expenses	340.73
Clerical Assistance	42.05
Balance, in Delaware Savings Bank	1095.73
Total	3187.25

Respectfully submitted,

T. C. JONES, Secretary and Treasurer.

Liberal applause was indulged in at the conclusion of the reading of the report.

THE SECRETARY: In behalf of the Auditing Committee.

REPORT OF THE AUDITING COMMITTEE.

OKLAHOMA CITY, May 16, 1910.

To the Natural Gas Association of America:

GENTLEMEN: Your Auditing Committee has audited the books, accounts and statements of the Secretary and Treasurer, for the period between May 17, 1909, and May 1, 1910, and finds the report to be correct.

J. M. GARARD, *Chairman.*
K. M. MITCHELL,
WM. W. WELCH.

MR. L. S. BIGELOW: I move the report of the Secretary and Treasurer be received and approved and placed on file, in the minutes of the proceedings. And I wish to say that this Association is greatly indebted to our Secretary and Treasurer for the splendid showing which he has just read to us, and also our President. It is a grand showing.

The motion, having received numerous seconds, was put and enthusiastically carried by a unanimous vote.

MR. W. M. WELCH: I believe that the successful showing made is due, largely, to the officers, particularly to the Secretary and Treasurer, and I move that a vote of thanks be extended to him for his very successful efforts.

There were several seconds to this motion.

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PRESIDENT MCKENZIE: Gentlemen, you heard the motion made by Mr. Welch. Those in favor say Aye.

Motion unanimously carried.

PRESIDENT MCKENZIE: I am sure there will be no Nays.

SECRETARY JONES: I am very much obliged, gentlemen, for the vote of thanks.

PRESIDENT MCKENZIE: The next business in order is the presenting of Applications for Membership and Balloting.

NEW MEMBERS.

Thereupon, the Secretary presented the names of the following applicants for membership:

ACTIVE.

J. B. Ardis, president Louisiana Gas Company, Texas street, Shreveport, Louisiana.

E. C. Beach, manager Pulaski Gas Light Company, 215 Main street, Little Rock, Arkansas.

Max Miller Bishop, inspector Lone Star Gas Company, First National Bank Building, Fort Worth, Texas.

Samuel T. Bodine, vice-president The United Gas Improvement Company, Broad and Arch streets, Philadelphia, Pennsylvania.

Arthur Booth, assistant general purchasing agent, Philadelphia Company, 435 Sixth avenue, Pittsburg, Pennsylvania.

Glenn T. Braden, president Oklahoma Natural Gas Company, 811 Farmers' Bank Building, Pittsburg, Pennsylvania.

J. A. Brake, superintendent Fort Smith Light & Traction Company, Sixth and A streets, Fort Smith, Arkansas.

J. R. Brummett, claim agent Lone Star Gas Company, Henrietta, Texas.

P. V. Byrnes, vice-president and manager Ontario Pipe Line Company, Limited, 72 James street, North, Hamilton, Ontario, Canada.

C. C. Cantrell, secretary and manager Central Light and Fuel Company, 15 East Hobson avenue, Sapulpa, Oklahoma.

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A. S. Cody, sales manager United Gas Light & Mfg. Company, 380 Third avenue, New York, N. Y.

T. F. Cole, manager Home Light, Heat & Power Company, 512 North Broadway, Pittsburg, Kansas.

B. J. Crahan, superintendent Joplin Gas Company, 318 Joplin street, Joplin, Missouri.

George W. Crawford, president The Ohio Fuel Supply Company, 2017 Farmers' Bank Building, Pittsburg, Pennsylvania.

G. W. Curran, comptroller Syracuse Lighting Company, Broad and Arch streets, Philadelphia, Pennsylvania.

J. W. Dana, counsel The Wyandotte Gas Company, Husted Building, Kansas City, Kansas.

B. G. Dawes, president Vivian (Louisana) Oil Company, Marietta, Ohio.

B. G. Dawes, president Vivian (Louisiana) Oil Company, Mari- Little Rock, Arkansas), 171 LaSalle street, Chicago, Illinois.

P. C. Dings, general manager Ardmore Gas Company, Ardmore, Oklahoma.

C. E. Dittman, manager Waynesburg Home Gas Company, Waynesburg, Pennsylvania.

Thomas Dolan, president The United Gas Improvement Company, Broad and Arch streets, Philadelphia, Pennsylvania.

Frank F. Finney, superintendent Gas Construction, Indian Territory Oil Company, Bartlesville, Oklahoma.

W. B. Foshay, assistant treasurer, secretary and manager United Gas Company, South Main street, Wichita, Kansas.

W. P. Gage, vice-president Lone Star Gas Company, First National Bank Building, Fort Worth, Texas.

W. C. Gibson, manager North Texas Gas Company, 613 Ohio avenue, Wichita Falls, Texas.

George S. Goff, general manager Crystal City Gas Company, 16 West Market street, Corning, New York.

H. B. Goodrich, manager Fuel Oil Properties, Gulf, Colorado & Santa Fé Ry. Company, Ardmore, Oklahoma.

C. Willing Hare, manager New Business Department, The United Gas Improvement Company, Broad and Arch streets, Philadelphia, Pennsylvania.

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Wade Hampton, Jr., superintendent Clayo Oil & Pipe Line Company, Bowie, Texas.

E. M. Henshaw, shareholder Olney Gas Company, Sumer Gas Company, 1654 College avenue, Indianapolis, Indiana.

D. Hastings, Oklahoma Natural Gas Company, 1021 Cincinnati street, Tulsa, Oklahoma.

H. C. Hoagland, manager Muskogee Gas & Electric Company, Muskogee, Oklahoma.

S. S. Hunter, manager Caddo Gas & Oil Company, Shreveport, Louisiana.

R. C. James, assistant auditor The United Gas Improvement Company, Broad and Arch streets, Philadelphia, Pennsylvania.

C. V. LaDow, manager The Fredonia Gas Company, Fredonia, Kansas.

E. J. Lambert, treasurer Midway Oil & Gas Company, Independence, Kansas.

Alanson P. Lathrop, president American Light & Traction Company, 40 Wall street, New York, N. Y.

Harry E. LeFevre, superintendent American Natural Gas Company, Middle street, Sharpsburg, Pennsylvania.

E. C. Lufkin, manager Natural Gas Department The Texas Company, Fort Worth, National Bank Building, Fort Worth, Texas.

James P. McCloskey, assistant superintendent Columbia Gas & Electric Company, Huntington, West Virginia.

C. W. Lemon, secretary Vivian (Louisiana) Oil Company, Marietta, Ohio.

R. W. McIlvain, charge of Land Department Arkansas Natural Gas Company, 518 First National Bank Building, Shreveport, Louisiana.

John L. Mann, gas and oil operator, Box 242, Billings, Montana.

John D. McIlhenny, president Gas Company of Montgomery County, Norristown, Pennsylvania, 1339 Cherry street, Philadelphia, Pennsylvania.

Emerson McMillin, chairman Board of Directors, American Light & Traction Company, 40 Wall street, New York, N. Y.

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Randall Morgan, vice-president The United Gas Improvement Company, Broad and Arch streets, Philadelphia, Pennsylvania.

H. C. Morris, superintendent Dallas Gas Company, Dallas, Texas.

Edgar M. Moore, Edgar M. Moore Company, 814 Farmers Bank Building, Pittsburg, Pa.

F. M. Neely, general superintendent Wichita National Gas Company, 412 East Maple street, Independence, Kansas.

W. H. Nicholson, capitalist, 132 East Fifth street, Erie, Pennsylvania.

J. D. Northrup, general superintendent West Virginia & Maryland Gas Company, 9 South Center street, Cumberland, Maryland.

J. W. Pratt, civil engineer, 219 North Central avenue, Chanute, Kansas.

P. I. Price, managing director The United Gas Companies, Lt., 45 Kind street, Catherines, Ontario, Canada.

James S. Postgate, mechanical engineer Kansas Natural Gas Company, Independence, Kansas.

E. D. Pyzel, gas engineer, Heerliegracht, 141-145 Amsterdam, Holland.

H. C. Reeser, secretary and treasurer The Ohio Fuel Supply Company, 2017 Farmers Bank Building, Pittsburg, Pennsylvania.

George Robinson, oil operator Wayne Oil & Gas Company, Independence, Kansas.

George W. Schell, chief engineer Mohican Oil & Gas Company, Howard, Ohio.

O. K. Shannon, secretary Couseman Light & Heating Company, 408 Rink street, Fort Worth, Texas.

Marvin Shiebler, gas engineer, 30 Church street, New York, N. Y.

H. G. Small, superintendent Kansas Natural Gas Company, 511 East Myrtle street, Independence, Kansas.

S. T. Stanford, attorney Wichita Natural Gas Company, Independence, Kansas.

S. B. Stewart, general contracting agent Philadelphia Company, 435 Sixth avenue, Pittsburg, Pennsylvania.

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J. C. Storm, president Amarillo Gas Company, 403 Taylor street, Amarillo, Texas.

J. W. Tidball, superintendent The Ohio Fuel Supply Company, 5229 Rose avenue, Norwood, Ohio.

F. H. Tidnam, manager Oklahoma Gas & Electric Company, 112 North Broadway, Oklahoma City, Oklahoma.

C. W. Tippy, general manager The Dallas Gas Company, 411 Commerce street, Dallas, Texas.

Paul Thompson, assistant to third vice-president The United Gas Improvement Company, Broad and Arch streets, Philadelphia, Pennsylvania.

Charles Van Sickel, manager Arkansas and Territorial Oil & Gas Company, 516 North "A" street, Fort Smith, Arkansas.

Walter S. VanSickel, superintendent Arkansas and Territorial Oil & Gas Company, 516 North "A" street, Fort Smith, Arkansas.

E. C. Weisgerber, manager and secretary Zanesville Gas Light Company, Sixth street, Zanesville, Ohio.

C. L. Willey, secretary-treasurer Bellevue Gas & Oil Company, Independence, Kansas.

Thomas Wittmer, superintendent American National Gas Company, 6113 Jackson street, Pittsburg, Pennsylvania.

W. L. Wood, Jr., manager Texarkana Gas & Electric Company, Texarkana, Arkansas.

ASSOCIATE.

W. B. Brendingler, Pittsburgh manager Ingersoll Rand Company, Farmers Bank Building, Pittsburg, Pennsylvania.

Frank Cavenaugh, salesman Maryland Meter Company, 1811 Peoples Gas Building, Chicago, Illinois.

William C. Chaplin, treasurer The Chaplin-Fulton Mfg. Company, 34 Penn avenue, Pittsburg, Pennsylvania.

M. A. Corbett, secretary Corbett-Stevens Company, 391 West Spring street, Columbus, Ohio.

Walker Ellis, salesman F. W. Heitman Company, Huston, Texas.

George W. Evans, vice-president Squarelite Mrg. Company, 133 South Akard street, Dallas, Texas.

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James P. Fisher, manager Kansas Office, Hope Engineering & Supply Company, 1011 New York Life Building, Kansas City, Missouri.

E. J. Fithian, treasurer Bessemer Gas Engine Company, Lincoln avenue, Grove City, Pennsylvania.

Louis B. Fulton, president Chaplin-Fulton Mfg. Company, 34 Penn avenue, Pittsburg, Pennsylvania.

Richard C. Hackstaff, superintendent Hope Engineering & Supply Company, Farmers Bank Building, Pittsburg, Pennsylvania.

J. D. Hardcastle, manager Spang Chalfant & Company, Inc., Saint Louis, Missouri.

J. D. Harper, president Texas Machinery & Supply Company, Dallas, Texas.

W. T. Holt, proprietor Kansas City Developing & Mfg. Company, 1710 Walnut street, Kansas City, Missouri.

Arthur B. Johnson, representative The Westinghouse Machine Company, 1119 Chemical Building, Saint Louis, Missouri.

C. J. Keeton, proprietor Kansas City Developing & Mfg. Company, 1710 Walnut street, Kansas City, Missouri.

J. J. Larkin, Larkin Brothers, Bartlesville, Oklahoma.

William McKee, auditor Chaplin-Fulton Mfg. Company, 34 Penn avenue, Pittsburg, Pennsylvania.

Sidney Mason, president Welsbach Company, Broad and Arch streets, Philadelphia, Pennsylvania.

Edgar M. Moore, Edgar M. Moore & Company, 914 Farmers Bank Building, Pittsburg, Pennsylvania.

William D. O'Neill, secretary-treasurer The Oil & Gas Journal, Tulsa, Oklahoma.

M. G. Reynolds, sole owner Reynolds Gas Regulator Company, 1609 Jackson street, Anderson, Indiana.

E. B. Rhea, sales manager Snow Steam Pump Works, 827 Scarrett Building, Kansas City, Missouri.

Forster Robinson, Robinson Uniform Compression Coupler Company, Casey, Illinois.

George W. Robinson, salesman Ingersoll-Rand Drill Company, 1007 Fullerton Building, Saint Louis, Missouri.

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Henry D. Schall, Gas Appliance Department, Detroit Stove Works, 2921 La Salle street, Chicago, Illinois.

C. H. Seidenglanz, representative General Gas Light Company, 1620 East 8th street, Kansas City, Missouri.

H. H. Sprague, president Sprague Meter Company, 205 Water Street, Bridgeport, Connecticut.

W. W. Strickler, Robinson Uniform Compression Coupler Company, Muskogee, Oklahoma.

John L. Sybrandt, district manager Ludlow Valve Mfg. Company, 503 Victor Building, Kansas City, Missouri.

PRESIDENT MCKENZIE: All proposed members, whose applications have been recently received, please rise.

ELECTION OF NEW MEMBERS.

MR. L. S. BIGELOW: I move that the Secretary cast the ballot of the Association for the new members.

MR. M. M. SWEETMAN: Second the motion.

The motion was put and unanimously carried.

SECRETARY JONES: It affords me great pleasure to comply with the motion just adopted, and I cast the ballot of the meeting for the gentlemen who have made application.

PRESIDENT MCKENZIE: The proposed members are elected.

SECRETARY JONES: We would be very glad to receive more applications, as the meeting progresses, and we can act on them as the meeting proceeds.

Thereupon, the next order of business being the address of the President, Vice-President John M. Garard assumed the chair, and the President delivered his address as follows:

PRESIDENT'S ADDRESS.

WILLIAM C. MCKENZIE.

There are so many good things planned for this meeting that I feel that our time will be pretty well taken up. However, there are a few live subjects which I should like to bring before you briefly.

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In my opinion—and I think it is the opinion of a great many of you—there are certain matters pertaining to the natural gas business which should be kept alive, and in some way discussed at every meeting of the Association.

These subjects should never cease to receive our attention, nor will they if we often discuss them; let us never be satisfied to allow them to drop out of sight.

I am sorry that I cannot here express my views on these matters directly to those of our co-workers who are not present with us today, but as these remarks will be embodied in the minutes of the meeting, which are open for their inspection and will be printed in the Journals, I trust those absent will derive benefits from these suggestions which I offer as the results of my own experience.

In the first place, are we, as Managers, Superintendents and Heads of Departments of the different corporations by which we are employed, doing our full duty? Unquestionably, we are at all times on the alert and very careful in giving our employes instructions on lines of economy and good service and courteous treatment to the public. But, I am afraid we are neglecting a very important part of their education, and that is on the line of their loyalty to their employer.

From whom do we with thousands and thousands of others, derive our livelihood? I have no way of telling which of you before us today are working for corporations or which are individual owners and are employing help. But, be that as it may, I think my remarks will apply to one as well as to the other.

Today, in dealing with the public, the corporation is being subjected to undue and unfair criticism, and I, as one having been practically all his life employed by different corporations, think the time has come when the tide of public opinion should turn; and I am also of the opinion that we who are reaping the benefits from these same corporations should be the ones who should endeavor to change this sentiment. I have observed that the public has not only the employer but the employe badly bluffed. I think I can demonstrate this point: Let a man who is employed by a corporation meet two or three,—maybe half a dozen—citizens, and in the course of the conversation it happens that his

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Company is mentioned (as it is pretty sure to be), he will silently disclaim and allow the opposition to go unanswered; or, if he opens his mouth, it will be to acquiesce in what the others say, rather than to express an individual opinion. I think it the duty for every man working for a corporation or individual owner to uphold that Company or individual at any and all times, and if he cannot conscientiously do so, he should not impose upon them by taking money for work which at best is half hearted and half done. I maintain that the employe who is not loyal to his employer cannot do full justice to either his work or his employer. I also think if a man is not satisfied either with employer or conditions he should make his grievance known in a business-like way and give his employer the opportunity to state his attitude in the matter, and if they cannot come to an amicable settlement then let him quit them on good terms and look for employment elsewhere, suitable to his particular case. Then in the future if opportunity warrants he need never feel any delicacy in asking these same people for another position, and they in turn will have no hesitancy in re-employing him,—generally on better terms than before. I dare say there is not a member of this Association today, employed by corporations or individual, who, if he were to resign his position, no matter under what conditions, could conscientiously say one word detrimental to his employer. I tell you if the employe will sit down and think this matter over carefully and give his employer the same consideration that the employer gives him, it will not take him long to make up his mind that his station as an employe is not so bad after all, and instead of eternally complaining of his condition and never missing an opportunity to abuse the corporation, will soon realize the necessity of a change of tactics. Then he will take the other course and find it to his advantage to speak for, not against, and try and give the public some of the real facts in the case, and thus make an honest effort to be true to his duty and to the corporation from which he draws his salary. As one who has worked for corporations all his life, I can earnestly say that all they require from the public, or the employe, is a square deal, and they are always ready to give the same in return; and we who enjoy the confidence and know the loyalty of our corpor-

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ations should make an honest effort at any and all times to bring about this change in public sentiment.

Just a word or two in regard to the manufacture of appliances: I want it understood right at the start, it is not my intention to rap anyone for what they have done; but instead, I want to have a heart to heart talk with the appliance men in order that we will all understand what we will have to come to in the future. I want to say that in my opinion the day has passed when we can put on the market any old appliances and say to the consumer that this or that article is as good as anything you can find for your heating purposes, and the economical consumption of gas. I think you all realize, and have for some time, that we have been selling natural gas at a rate too low per thousand, and that we will all commence sooner or later to raise the price of our commodity; and when we do, there is going to be a demand right there for the appliance that will be the most economical in the consumption of gas and give the best results for the least fuel consumed. I think from now on we will all have to put our best efforts forward to accomplish these ends, and we might as well realize these facts right now, for the time is at hand and just as sure as I am talking today the manufacturer that realizes this condition first and commences putting the better appliances on the market is the one that will win out. Now the fact is—and I think you will all bear me out in this—that since natural gas has been introduced in a great many communities, the price of other fuels has not been cheapened at all. And it has been my experience that natural gas at twenty-five cents per thousand will just about break even with the prevailing price of coal when you put it to use for heating purposes; and it is a fact, as you all know, that we can only guarantee a given B. T. U. for every thousand cubic feet of gas. You might still use the old saying: "Well, we can sell all the gas for domestic consumption we can get, for people will be willing to pay from twenty-five to thirty per cent. more for gas than they would pay for coal, on account of the convenience and cleanliness of gas." Well, that has proven so to a certain extent in the time we have been selling gas at the low price that has prevailed; but, when we are compelled to raise the price for one reason or

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another, and this increased price is very much higher than coal, we cannot assume that we will sell as much of our gas for the reason of it being cleaner and more convenient, as we have in the past. We have only a small percentage of consumers on our books that can afford to take these conditions into consideration; therefore, it will fall on these manufacturers, as I have said, if they want to keep their goods on the market, to make an article that will insure the consumer an efficient and economical means of using our product for their domestic use in the heating of their homes.

There are a few thoughts that occur to me in regard to the illuminating end of our business.

I have no means of telling how many of you gentlemen that are now managing natural gas situations have ever managed a manufacturing gas property; but I for one, who has had both to contend with, cannot help but think we are, while in the natural gas business, making a great mistake by not paying more attention to the lighting end of our business. I can remember when we were distributing manufactured gas, we had to be on the lookout at all times, in order that the other fellow did not slip in and take our customers away from us and substitute his product for ours for illuminating purposes; and at that time all the argument necessary for him to make was that his product was easier to handle and was more attractive and ornamental. Therefore, I contend that we may some time be put to a much larger expense to get this end of our business worked up again than it could possibly cost us at this time to follow it up and keep all of it we can. We have a much better chance at this age than we ever did to do this; for while it is not necessary to take into consideration the cost between our product and any other, we have conditions improved to such an extent that we can meet the other fellow with his old argument of attractiveness and convenience. For, it can hardly be said today that we cannot produce the same effect, and I don't know but what it might be said we can even do better, when we take into consideration the improvements that have been made in the last few years in appliances for the use of gas for illumination, adding to its quality. Doesn't it seem queer to you, when you give

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this matter your sober thought, that at the cost we are selling our produce that there would be any other agency employed in our cities for producing illumination? Can you tell why this is? I can. It is just because we are not paying as much attention to this branch of the business as we should; and my purpose is to call your attention to this condition, to get you to thinking, and at our next meeting, or at this meeting, get your expression on the subject. For, as I have said, and I want to emphasize that we will some day see our mistake if we do not commence soon to correct the condition. I imagine that a good many of us will say that we cannot make any profit on this branch of the business. Well, suppose we grant that; but we won't grant but that we could at least break even. And, suppose we do not show a profit and only, as I have said, break even, we will have our business that is so desirable, and will not be called upon to expend a large amount in order to regain it at, I am sure, a big loss for some time before we could commence showing a profit.

Liberal applause followed the delivery of the President's address.

VICE-PRESIDENT GARARD: I have the honor to appoint the following committee on the President's Address: L. S. Bigelow, S. S. Allen, Jr. and K. M. Mitchell.

Thereupon, President McKenzie resumed the chair and announced the next order of business as Reports of Standing Committees.

PRESIDENT MCKENZIE: Mr. Mitchell, I believe you are on the committee that was appointed last year to report on the selection of an official badge.

MR. L. S. BIGELOW: I will have to ask the indulgence of the meeting. The committee has not gotten together yet. At a little later period I will be glad to report, during the meeting.

PRESIDENT MCKENZIE: Very well. The next in order, then, is Reports of Special Committees. Is the Chairman of the Entertainment Committee in the room? Have you any announcements to make?

Whereupon, M. W. Walsh, Chairman of the Entertainment Committee, announced, among other things, the most excellent

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exhibit of natural gas appliances and utilities on display and for inspection at Oklahoma City's spacious Auditorium, from 10 a. m. to 10 p. m. each day. Big Chief Quanah Parker and his tribe of Comanche Indians to give regulation war dance, as seen on the Indian reservation, to be seen each day and night of the convention; plenty of music. Automobile ride, seeing Oklahoma City and Natural Parks on twenty-six miles of boulevard; entertainment at the Open Air Theatre; the Oklahoma City Fire Department exhibiting their celebrated fourteen horse street hitch; the banqent to be held at the Lee-Huckins Hotel, and then proceeded to announce so many other little entertainments and courtesies to be extended to the Association that we cannot now enumerate them, and the announcements were greeted with frequent applause.

MR. J. M. GARARD: Mr. President, it may be a little early, but I think a great many members of The Natural Gas Association know how Mr. Walsh has labored for the success of this meeting, and I would like to have an expression of the gratitude I know we all feel, for the manner in which he has planned and arranged for our instruction and entertainment; and let it be by a standing vote.

PRESIDENT MCKENZIE: Gentlemen, all stand. I know you will.

Amid hearty and generous applause, all present arose.

MESSAGES OF REGRET.

PRESIDENT MCKENZIE: The Secretary has several telegrams and letters he would like to read.

Secretary Jones then read — Telegrams:

From Governor Harmon, of Ohio: "Remembrance of last year makes me sorry I am not with you now. Oklahoma will make you grow." (Applause).

From U. S. Senator from Oklahoma, Thomas P. Gore: "Regret exceedingly official duties render it impossible for me to be present."

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From U. S. Senator from Oklahoma, Robert L. Owen: "My duties will make it impossible for me to attend the Association meeting May 17th, 18th and 19th."

From ex-President of the Association, J. C. McDowell: "Please express to convention my sincere regret that I cannot be with you this session. I fully intended to be with you until last moment, when I was compelled to change my plans. Please request George W. Barnes to read my paper on Conservation of Natural Gas."

From P. W. Lupher, of Columbus, Ohio: "Sickness has robbed be of a pleasure that I look forward to each year, and I regret very much that I cannot be in attendance at the convention. I shall miss the handshakes, and wish you would express my heartfelt regrets."

Letters from: A. Hurlburt, Kansas City, Mo.; Mr. Walton Clark, Philadelphia; Mr. C. B. Strohm, of the Illinois Gas Association; Mr. Alanson P. Lathrop, of New York; Mr. Irvin Butterworth, of Detroit, Mich.; Mr. A. B. Beadle, of the American Gas Institute, New York; Mr. Joseph F. Guffey, of the Philadelphia Company, Pittsburg; Mr. E. C. Brown, of New York; Mr. Samuel T. Bodine; Arthur H. Huey.

Mr. L. S. BIGELOW: I understand that Mr. Dunkel, who was to have read a paper at this meeting, is quite ill, and I move you, sir, that a telegram of sympathy be sent to Mr. Dunkel by this Association.

The motion was put and unanimously carried.

PRESIDENT MCKENZIE: The Secretary will prepare a message.

The following telegram was then prepared and sent to Mr. Dunkel at Lawrence, Kansas: "Exceedingly regret it is impossible for you to be with us. Best wishes for a speedy recovery. Natural Gas Association of America."

Thereupon, after the transaction of some further routine business, at the suggestion of M. W. Walsh, Chairman of the Entertainment Committee, and by general consent, all officers and members formed in line and marched in a body to the Auditorium to inspect the exhibits and enjoy the entertainments.

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Session of Wednesday, May 18th.

The Association met at 10:00 o'clock A. M., Wednesday, May 18th, 1910.

After calling the meeting to order, President McKenzie said:

We have the pleasure this morning of having with us the Hon. D. T. Flynn, who, having kindly consented to speak to us, I now introduce to you. (Applause).

ADDRESS.

HON. D. T. FLYNN.

Mr. Chairman and Gentlemen:

As a citizen of Oklahoma, more particularly one of Oklahoma City, I felt, a year ago, when application was made by us that you name it as a place for holding your next meeting, as the city was composed of good fellows (nobody was eligible to your Association unless he was a good fellow), that we were sure to have the annual meeting here. You will pardon me if before going into some of my limited experiences in the natural gas business, I talk a little bit; first, about Oklahoma. Of course, everybody who lives here is proud of it. There are some things, though, which we don't mention, that we are not as proud of as others; but I think the time will come when we will obliterate them, through having gone beyond the stage of experimentation. To even our citizens it will seem hardly possible, still 'tis true that, taken all in all, the new State of Oklahoma is the richest in natural resources of any of the United States. The most authentic reports obtainable place it first in many of America's products and, as to its aging as a State, history fails to offer a comparatively close second. Today no other State offers such safe and extensive inducements for capital as does all Oklahoma. It has today, available but undeveloped, awaiting only the active use of capital, 7,000 square miles of land underlaid with coal of the best quality. Although Pennsylvania, West Virginia and Ohio are great in the production of petroleum, Oklahoma exceeds the three combined. It also has the deepest and the shallowest oil well in the world.

In the item of grand prairie, Oklahoma equals Illinois, and

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is generally considered a "Prairie State;" therefore, you will be surprised to learn that we have more timber in this State than can be found in the combined States of Wisconsin, Michigan and Indiana. Then, you are often told of the granite quarries of Vermont, New Hampshire and Maine, but when we tell you that the geological men say that Oklahoma, within her borders, has more and finer granite than can be found in those three put together, you are again startled, even to wondering what we have next.

Well, we are now talking of quarries, and, as marble is of great importance, we find that Nevada, New Hampshire and Massachusetts are considered in its production; but, again, find our State surpasses all these taken together. Although slightly developed as yet, we are fourth in the output of kaolin, one of the best fireproof materials known to science today. Oklahoma has more magnesia and dolomite rock than can be found in all of the States of the Union taken together, all of which seems wonderful, almost even too big to accept at one dose; but if you will take time and pains to investigate, you will not only find as correct in these statements, but you will also learn of many more ways in which Oklahoma leads. However, we have not yet finished our list. As to Portland cement, we stand second in its manufacture, and that industry is hardly started. Colorado excepted, we have more rivers with natural drainage than any other State, so far as capacity is concerned. It stands fourth in its stream fish-products, and leads the world in briny streams, having the only river whose water is salty for more than 200 miles in length. Admitting we stand twentieth as to the production of cotton, yet we are second in its productions from a monetary standpoint.

Oklahoma has more wheat land than either of the Dakotas, more fruit lands than California and, though away down in the list as to the acreage, we are tenth in orchard products, second as to the cantaloupe, third as to watermelons, first in tonnage and third in money value of alfalfa, and we produce a sufficient quantity of foodstuff to supply any other three States in the Union, while at the same time we purchase more

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commodities from out of the State, population considered than any other State. Aside from California, it has the most healthful climate of any and is the only State where smallpox never reaches a pestilential stage. This disease in Oklahoma has no frightful feature in this, as in other States.

Since 1907 Oklahoma has excelled in growth any other State, has more cities that have doubled in population than did any other State or territory in the history of our nation. Oklahoma is unquestionably the best State ever admitted to the Union, and although it is advancing the fastest, still it is a lamentable fact that her farmers underestimate the value of their holdings at least 90 per cent. It makes no difference what price you get for your farm, there is no other place in this or any other country where you can take the price received and purchase better land, all things considered. I desire to refer to that, first, in order to give those of you who have not become residents of our State some idea of its possibilities. In area we equal the combined area of the States of Ohio and Indiana. It was the custom of the general government, years ago, for the purpose of offering an inducement, to say to a man, "If you will go West, if you will leave the badges of civilization and if you will take it all and go out on the prairies, we will give you 160 acres of land." The invitation was accepted. Beginning with the State of Ohio, from there to the Rocky Mountains, thence to the Pacific Coast, on the North, including Alaska to the British Possessions, this government of ours said, as an inducement to develop the country, "We will give you 160 acres." I used to say, when I was in politics, that the government used to say to a fellow who wanted to come West, "I will bet you 160 acres of land you can't live there five years," and if they did they could have a patent for the land. Now, that is the difference between the pioneer who developed the country and the man who developed the gas and oil industry. The homesteader on the claim took no more desperate chances than did and does the man today who pioneers in the oil and gas business, and who puts his last five or ten thousand dollars into the hole and then discovers, when he gets through, that all he has found is a duster. Your experience in Oklahoma — I will include in that description In-

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dian Territory — has not been very inviting. I remember well, at 3 o'clock a. m., at Tulsa, I said to a friend of mine, "What in thunder are you doing here?" He said, "I am getting oil and gas leases." I asked, "How are you getting along?" He replied, "I started in three months ago and got 12,000. acres. I complied with the rules and regulations, but just as everything was properly fixed I found there was a new set of rules and regulations." He said, "I paid $5,000 to the parties who have this land for these leases, in addition to agreeing to pay the royalty," and that he feared to get any more leases or put any more money in. Finally it dwindled down to 5,000 acres, and I started to Muskogee (the papers were on the way to Washington) when another new set of rules and regulations were promulgated that knocked me out again. I said: "Well; how are you getting along now?" He said, "That is what I am over here for. I have a prospect of signing up for 1,200 more acres, but by goodness I am afraid of another set of rules and regulations." I don't think it is necessary for me to explain to you how I happened to be up at 3 o'clock in the morning with an oil man and a gas man. However, that was before prohibition had gone into effect. (Laughter). The homesteader was given 160 acres, and if he hung it out he got a deed for it. You come out into the country to find somebody else has the land and you pay for the privilege of trying to do business with him, which the homesteader never had to encounter. When you accomplish that, then you agree to pay a royalty, if you strike it, which is well and good; but if you don't, you are worse off than the homesteader was, because he still has his land, even if a drouth strikes him. Of course, he is more fortunate, for he can return to his wife's relations; but if he doesn't have any such he has the land that he can stay on, anyhow. You people haven't had that privilege. I think no other class of people, either in Oklahoma or anywhere else, have had to take more 16 to 1 shots than have the oil and gas men. (Applause).

Mr. Flynn then recounted, in a very humorous vein, some of his many experiences in the gas business, especially in getting the Oklahoma Gas and Electric Company (of which he is now the president) established, and his remarks were frequently inter-

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rupted by laughter and applause. He recounted experiences of the gas and oil men with proposed legislation in Oklahoma, and continued:

I think the gas men and oil men in Oklahoma ought to begin to realize that, if they want protection from the demagogue, both in the legislature and out, they have got to give some attention to their own business on top of the ground as well as underneath. (Great applause). We hear a great deal nowadays about the conservation policy of the government. It will be a mighty good thing for the gas men of this State, with the numerous wells that are spouting gas turned loose into the limitless sky, if they insist upon a little bit of conservation in their own particular interests. I have tried to impress upon you, in all seriousness, to try and attend a little bit to your own business on top of the ground. I don't believe anyone in the State of Oklahoma is going to confiscate your property, but that you will go on to ultimate success, believing that in the English language there is no such word as "fail." I thank you, Mr. President, and gentlemen.

Amid great applause it was moved (numerously seconded) that a vote of thanks be accorded Mr. Flynn for his able and interesting address, which motion was put and unanimously carried.

REPORT OF COMMITTEE ON BADGE.

PRESIDENT MCKENZIE: Mr. Mitchell, I believe there is a report of the Committee on Badge?

MR. K. M. MITCHELL: Yes. Mr. President and gentlemen: At the meeting in Columbus, Ohio, a Committee was appointed on the question of selecting a badge for the Association, and your committee beg leave to report and submit herewith a sample pin or emblem, for your inspection and adoption.

The pin is of solid gold, 14 carats, 7/8 of an inch in diameter, with safety catch. The fall is convex and of blue enamel. Upon this is North and South America in gold. A hand with torch is raised from on the face of that.

The pin is emblematic of our Association, which is the Natural Gas Association of America, North and South. The

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torch and flame is emblematic of heat and light which is freely being shed by a divine power. The figures "1906" is the year our organization was formed. The name of the Association is in letters at the bottom outer edge or circle of the pin. The committee has striven to give this subject the greatest and highest conception which is warranted by the society which seeks to serve and make useful this God-given product which He has so mercifully stored away for ages for man's comfort and happiness.

K. M. MITCHELL,
F. B. MUELLER,
Committee.

It was then explained, in general discussion, that the pin could be ordered made for use as a pin, as a button or as a watch fob, at a price of about $4.25 or $4.50, if ordered in lots of 100 or more.

MR. M. M. SWEETMAN: I move you that the report of the committee be accepted and that the committee be instructed to order whatever number of pins, either with a fob or with a pin, as the Secretary instructs them that he has orders for.

MR. J. P. STRICKLER: I second that motion.

MR. L. B. METTLER: I believe we ought to adopt the report of the committee and make this the official badge of this Association, and I will so amend that motion.

MR. J. M. GARARD: I would ask the Chairman of the Committee whether that pin might not be made to be used as a button rather than a pin? I think that would be rather convenient.

SECRETARY JONES: It could be made either way, as ordered.

MR. L. S. BIGELOW: It can be made just as you want it.

PRESIDENT MCKENZIE: Mr. Sweetman, is Mr. Mettler's amendment agreeable to you?

MR. M. M. SWEETMAN: Yes; I withdraw my motion and second his amendment, that it be made the official badge of the Association.

The motion, as amended, was then put and unanimously carried.

MR. M. M. SWEETMAN: I move you that the Secretary be instructed to arrange to take orders from the members and I

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understand that they can order those at that price in lots of not less than 100.

The motion was seconded, and, after some discussion, put and carried.

PRESIDENT MCKENZIE: I am very sorry to announce that Mr. A. Hurlburt, who has written a paper on "Domestic Installations" will not be with us. He is unavoidably detained at home and Mr. C. W. Sears has kindly offered to take care of Mr. Hurlburt's paper. Mr. Sears will now read Mr. Hurlburt's paper.

DOMESTIC INSTALLATIONS.

A. HURLBURT.

The great bulk of our business depends on the amount of gas we can sell for heating to domestic consumers, and therefore all Natural Gas Companies, whether they do any installing of appliances themselves or not, should be vitally interested in the kind of appliances in use by their consumers, and to see that these appliances are as economical as possible; and moreover an earnest effort should be made to see that the consumer is in shape to take care of himself in the way of heating in case of a temporary shortage of gas, for unless such is the case, there is liable to be complaints and loss of business, and if these few notes on domestic installation serve to bring out a solution of this problem, our time will be well spent.

The methods of heating homes may be classified as follows:

1. Small stoves in each room.
2. Hot Air Furnaces.
3. Steam Heating System.
4. Hot Water Heating System.

Of these methods, with us hot air furnaces are by far the most common.

A few fundamental facts should be borne in mind in *all installations,* and they cannot be too strongly stated or enforced.

All appliances should be rigidly connected with iron pipe. All appliances should have a flue connection connected to a regular chimney. There should be a damper placed in this flue,

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which should however not completely close stack and in cases of furnaces this should be placed between check draft and the furnace. All consumers should be warned against flues becoming stopped up with soot, where soft coal has been used previous to burning gas. Otherwise there is liable to be complaints of leaking gas, where the trouble really is fumes of incompletely burned gas being forced back into the house and the efficiency of the appliance is materially reduced.

A thousand cubic feet of natural gas under normal pressure and 60 degrees Fahrenheit, weighs about 42 pounds and when burned completely, forms 95½ pounds of water; and you can readily see that if the chimney is full of soot, it does not take long to saturate it with water, and then it falls to the first elbow in the flue and very effectually shuts of all draft.

In heating houses by individual stoves, in a great majority of cases, it has been far more economical to put aside the old coal stove and install in place a small gas heater. Where this is done of course, the people can always set up the coal stove again and are ready to take care of heating at least a portion of their house during a temporary shortage, or in some cases people have left a coal stove in one room, figuring they would only use it in case of emergency and live in the part of the house where gas was being burned.

In Kansas City we have a number of places in the eastern portion of the city where people actually have the gas stove and coal stove set up in the same room. The use of small stoves often calls for several flue outlets, and there are very few houses built where there is a flue in every room; but the carrying of a flue pipe through the wall, which may be a safe proposition with coal, although annoying, is absolutely dangerous with gas, on account of the fact that the wind blowing from the wrong direction is liable to put the gas stove out entirely; whereas, with coal, this is practically impossible, and the only result would be dirt and the products of combustion getting back into the room.

There are on the market several small combination coal and gas heaters, and possibly some of the gentlemen present can tell something about them. We have not run across any in use in our city, however.

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The disadvantage of heating a house by small stoves, is that the floors of the rooms are usually cold, although undoubtedly if the stoves are properly handled, it is by far the most economical plan yet devised; as shown by comparing gas bills of similar houses.

In places where the people prefer the old coal stove converted to gas, the usual method of doing this work consists in placing a ring burner with one gas orifice in the fire pot and then a certain amount of artificial fuel is put in the fire pot, on the burner.

In reference to this matter of artificial fuel, we very frequently find people fill up these fire pots with all kinds of material, thinking the more they put in, the more efficiency they will get, which very frequently causes serious injury to the burner.

In Kansas City, and in most cities, I think, you will find that a great majority of houses are heated by hot air furnaces. This method of heating the ordinary house is used because of the cheapness of first cost of installation, which is reasonable, and it is possible to heat the average house comfortably by this method. The installation of burners in this type of furnace probably represents with us 90% of the work we have done. The question of making some provision for heating houses of this kind in case of shortage of gas is a problem which still remains unsolved in most cases. It is very exceptional that people want small stoves in any of their rooms where they have a hot air furnace, and I think I am safe in saying that 90% of all the mantel grates in use in Kansas City are only fit for burning a small quantity of gas on account of small fires or none at all. Therefore, some method must be devised whereby either the gas burner can be taken out of the furnace and coal substituted, or coal burned in the furnace while the gas burner is there, or an auxiliary gas furnace attached to the hot air drum.

A great majority of these furnaces have round fire bowls, but we have a few large houses in which the hot air furnace is built up with brick and use a square fire box.

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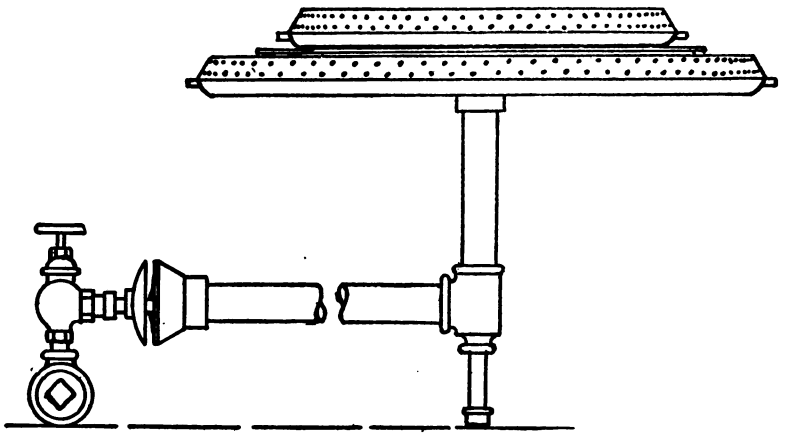
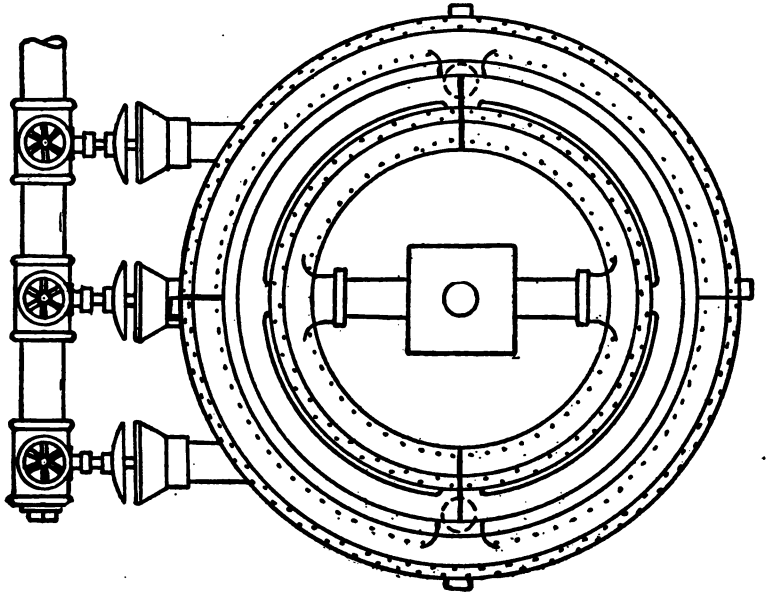
Sketch "A".





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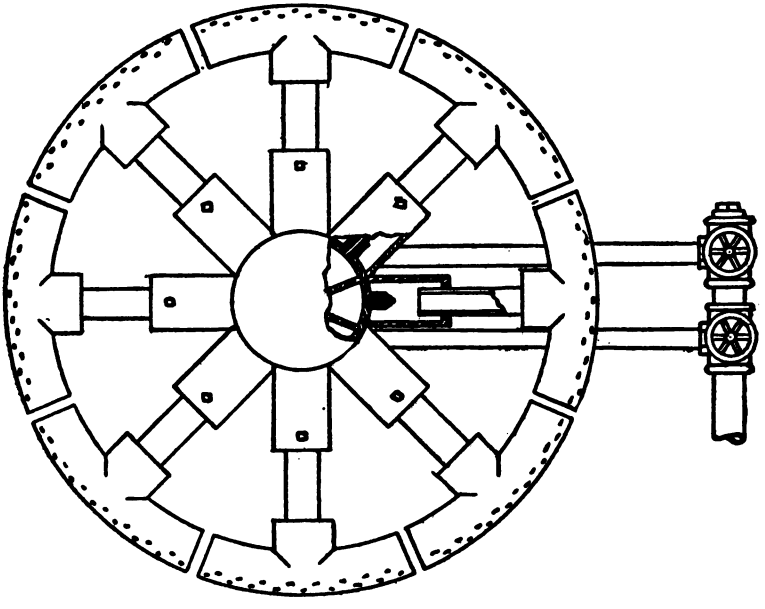
BURNERS USED IN ROUND FIRE BOXES.

1. Sectional ring burners with drilled ports, made in one, two or three sections, with constant diameter, with a double row of ports drilled on outer edge or double row of ports on outer and inner edges. These burners are fitted with or without a center burner. Some designs can be connected to the mixers from the top door, thus leaving the grates in place. These burners are all arranged for a gas valve and mixer to each section.

Sketch "B".



2. Rings made up of a number of small sections which are adjusted to the diameter of the fire box are fed by one or two gas valves into a center head, and the mixers are on a level with the burner, making the adjustment of air very difficult.

3. Two part burners with ports formed by corrugations in the outer joint made in various sizes and shapes allowing several sections to be put in the fire box. They are liable to warp

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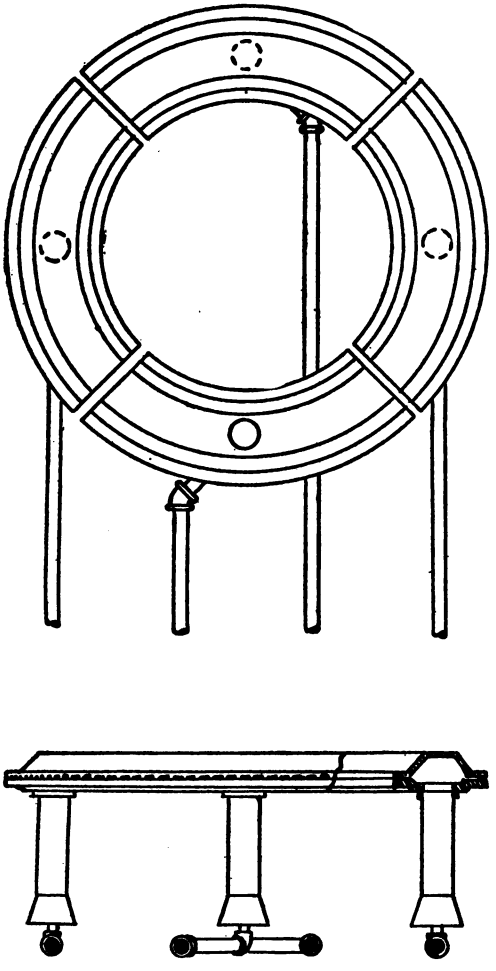
and open the ports, causing back firing and incomplete combustion.

Sketch "C".



4. Burners in which the air mixers are formed by short pieces of pipe being held above the gas orifice on a frame. These orifices being drilled in a flat surface of a casting. The

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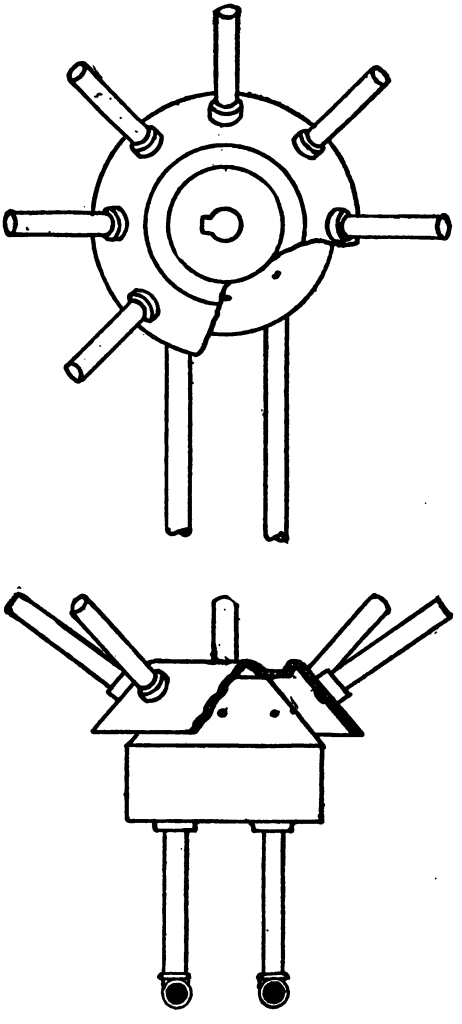
rust and ashes from the furnace collects on this burner and gradually smother the jets from the orifices, causing the flame to jump back through the short pipe and burn in the mixer.

Sketch "D".



5. Burners in which no air mixer is used. The gas issued from orifices directly against the fire bowl or fire brick. These

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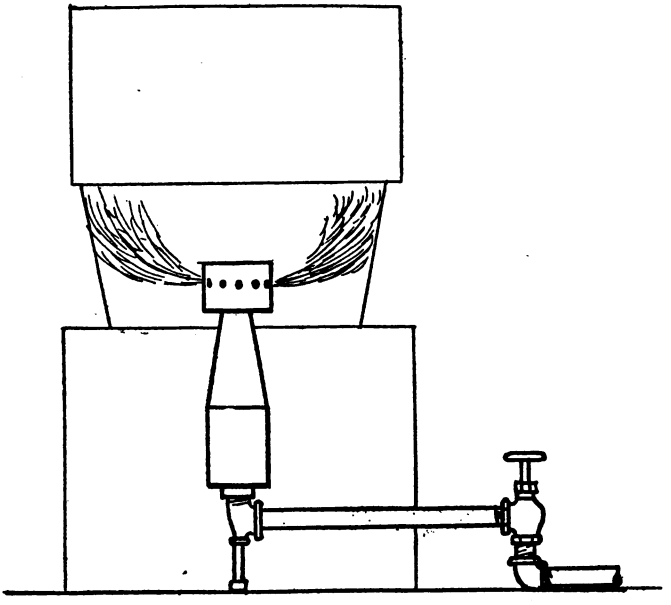
burners are rather destructive to the cast iron fire box, due to excess heat, also owing to the high ignition temperature of natural gas, the jets are liable to blow themselves out and thus allow the gas to escape unburned.

6. Burners composed of an air mixer and orifice and a piece of pipe arranged to blow a jet of gas into red hot fire brick, known as "blow burners." The brick may be arranged

Sketch "E".



in various ways to so concentrate the flames that none of the gas will escape unburned.

(Description of other burners).

Owing to the fewer number of hot water and steam plants in which rectangular fire boxes predominate, there are only a few designs of burners used in them.

A. Cast iron drilled multiple square sectional burners.

B. Cast iron sectional two part with corrugated surface to form the ports.

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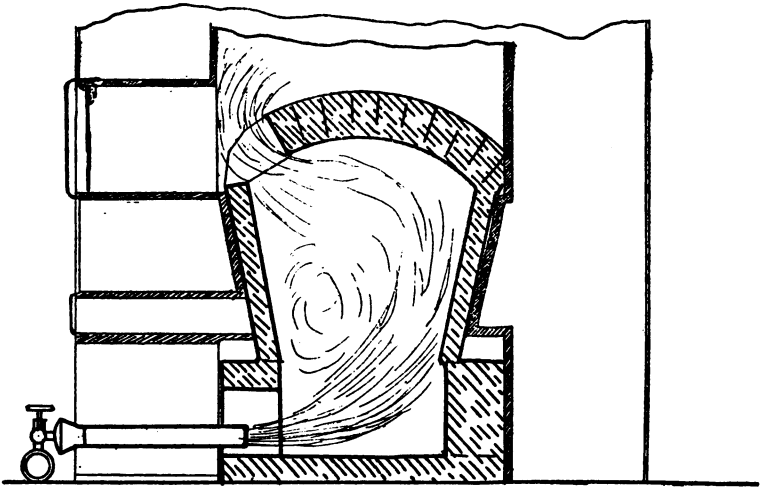
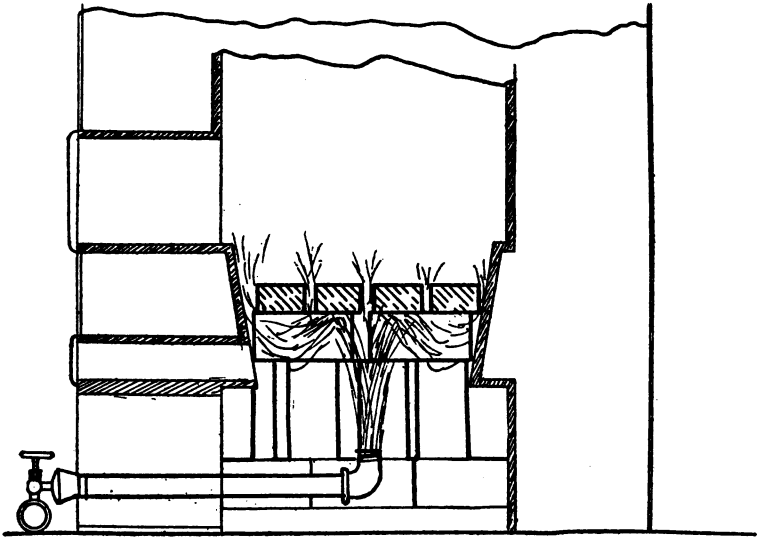
Sketch "F".





Sketch "G".

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C. Blow burners with brick checker wall or arch to cause perfect combustion and thoroughly mix the gas. (And as the principle involved is the same as with round furnaces, I shall make no further comment on square furnaces).

In Kansas City, in figuring on heating houses, we estimate first on the amount of gas needed, allowing approximately 100 cubic feet for each burner, or 100 feet per square foot grate surface. The size of service necessary allowing not over five-tenths drop in water pressure from main to meter. The meter capacity is the next to consider, and as a general rule we put in a 5-A meter, on houses up to six rooms and in houses from six to ten rooms, unless the rooms are very large, we use 10-A meters.

The capacities of "A" meters are as follows, under about 3/10 loss of water pressure.

5–A meter	175
10–A meter	375
30–A meter	860
60–A meter	1600

We never use anything less than a 5-A meter where any heating is done. After the meter we try to see that all piping to a furnace is such that there will be only about 2/10 loss of water pressure from meter to furnace, and generally speaking, this means an 1¼ inch or 1½ inch pipe for the average house.

SIZES OF PIPE TO SUPPLY HEATERS.

	Length.	10 rooms or under.	11 to 15 rooms.	16 to 26 rooms.
Heater	Under 75′	1½″	1½″	2″
Only	75 to 150′	1½″	2 ″	2″
Heater	Under 75′	1¼″	1½″	2″
And Range	75 to 150′	2 ″	2 ″	2½″

Sizes for runs for heating other buildings and power plants we insist should be taken up directly with the company to insure satisfactory service, and we make the plans for piping, giving the plumber the sizes of pipe required. We are very strict on this question of pipe sizes, and will not pass plumbing jobs where

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pipe schedule is not lived up to, and refuse to set a meter or turn on gas until job is approved; so we have very little trouble now with small pipe.

In Kansas City we started to use nothing but ring burners of the first type with double row of holes drilled both on the inner and outer edge and made in two or three sections. To install these burners we take out the grate and ash door, then we put burner in place supporting it above the position of the grate by means of legs extended down to the floor. A loosely fitting sheet of tin is placed directly under the burner to keep burner from getting too much air and reduce the draft, and this allows air mixers to work properly.

This type of installation has given entire satisfaction in most cases, but we have found that we often had to do considerable experimenting to find just the right height to set these burners in different makes of furnaces, and the question of use of artificial fuel is one that has caused any amount of trouble. Some furnaces have given best results without any fuel, others seem to work well with a small upright tile set around the burner. Several large flat tile leaning from center burner to edge of furnace causing a retarding action of gases, or a combustion chamber in fire pot have in some cases worked very well indeed; but the throwing of old brick or artificial fuel on burners to a depth of 6 to 12 inches is positively detrimental and causes the burners to float and also ruins the burners in a very short time.

We found that this burner was not always satisfactory particularly where a furnace was too small for the house, or in fact in very large houses; for it was impossible to burn sufficient gas to keep houses warm, and in such cases we resorted to the blow burner type of installation with the tight arch, and we found this worked very well indeed. I think the sketch given herewith shows plainly the general scheme of this installation. I am rather backward about recommending this installation very generally on account of its inaccessibility; that is, the fire cannot easily be seen and care must be exercised in lighting. There is only the small place in the top front part of the arch through which a lighted taper or paper can be introduced to light this burner.

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Both of these installations are open to the objection that they are hard to take out and the grate must be replaced. However, we have a great many in operation in Kansas City that were put in three years ago, and have never been removed.

Large sections of our city have never been so badly affected by low pressure that people have felt it necessary to make any change, and in other parts of the city where there has been cause for complaint of low pressure, many people have put up with the cold and lived in one or two rooms with a small coal grate or other stove and left the furnace alone. These types of installations are however very liable to cause much trouble and the consumers much suffering if there should be a complete shut down of the lines, due to a break, unless the consumers have arranged some other way of taking care of themselves.

In all our installations, care has always been taken to see that a damper is put in the flue pipe, and this should be placed between the furnace and check draft, otherwise the fumes from the furnace are forced out of the check draft when damper is closed too far.

We have in use, almost every conceivable type of burner made; but I think they are really all covered in my general classification.

The second class of burners that I speak of, are practically like the first class except that they have air mixers placed so they cannot be adjusted without taking the burners all apart.

The third class of burners are quite similar to the first except for corrugation in castings in place of drilling and the large flat surfaces exposed are much more liable to warp than the burners of the first class.

The fourth class is a burner not very generally used and with which we have had quite some trouble, due to stopping of holes in burner. Then this burner is often covered with artificial fuel and the mixture of air and gas must of necessity be very uncertain.

Burners of the fifth class need no special comment, as we all know that for heating, the better mixture of air and gas that is made, the better the combustion; and the shooting of a pure

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gas flame directly against any part of the furnace is to be avoided.

In regard to hot water or steam installations, we use practically nothing but blow burners with a checker wall or loose arch, and have found it the most satisfactory installation that we have yet tried.

These same types of burners have been used in the working out of combination furnaces, or furnaces where the burners can be easily removed and coal used. For instance, the first type of burner used in two sections, has been placed in many furnaces through the stoking door on a swing joint, and burner set upside down on a brick, set on top of grates. The stoking door is replaced with a tin door, fitting over the pipes, to shut off air. The air mixers are then at the stoking door instead of ash door.

These burners are pulled out in case of shortage of gas and coal is used. The change can be made in a very few minutes. With this arrangement the fire will flash back under higher pressure than will be the case when burners are installed with gas coming from below, but this objection causes very little annoyance.

Several furnace builders are now inserting a ring in the fire bowl. That is, the ring fits between the furnace castings and cannot be removed. This ring is in some cases placed near the grate and in other furnaces up near the stoking door. Sometimes the holes are so drilled that the flame shoots straight out to center of fire pot, while other makers drill the rings so as flame shoots downward alongside of fire bowl.

In all these styles of furnaces, the mixers are on the outside of furnace at sides of same, and are of good design, except they are inconvenient to light as the operator cannot watch the burner while turning the valve.

Some makes of furnaces can be changed to combination from the old furnaces at comparative small figure, by inserting this ring between upper and lower section of fire bowl of furnace and then lengthening the sheet metal jacket.

Some of the drawbacks to these furnaces are that they are not as economical with gas as other types of burners, especially after coal has once been used, for dirt will get into the holes

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and they will corrode and warp out of shape, especially when drilled on the horizontal. The rings will warp with coal fire if they are set too low and even if they are higher up they will warp if a rapid hot wood fire is started or coal is piled up too high. The objection to putting burners up so high is that all the surface of the fire bowl is practically lost for radiation purposes. Certain types of blow burners are quite frequently put in the stoking door of furnace to burn gas and are swung out when the gas is short; but all furnaces of a combination type except possibly the building of an additional furnace for gas only, and attaching it to the hot air drum of the old furnace, are open to the objection that they are not quite as economical as are installations put in with the idea of burning gas only.

This question of economy in house heating, in burning gas, is a very hard one to get much information on. I have gathered a lot of data on houses of the same kind, with installations almost identical, and yet bills would vary so much that comparisons are almost useless, except to say that servants operating gas furnaces can easily double bills without any effort.

I want to call attention to the fact, too, that many times the installation of the burners are not the cause of trouble in heating houses. Very often it is in the house itself; and more often there is something wrong with the furnace. The furnace not being cleaned or so arranged that air does not circulate on account of lack of head room to give any rise from furnace to ceiling of basement; long horizontal runs of hot air pipes et cetera.

DISCUSSION.

MR. L. B. METTLER: Three years ago, at Joplin, I called the attention of the members of this Association to the danger of putting a damper in the flue pipe. Since that time, I found I was absolutely right in my contention at that time. At such time I was like all other members of this Association. We are all looking for information along the line of experience that we can get, and to substantiate what I said at the time, regarding the putting of dampers in the flue pipes, I will call your attention to the trouble that a very good friend of mine, a Kansas City

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plumber (one "Eph." Daugherty), had. He installed a ring burner in a furnace, very carefully laid some firebrick around the edge to try to hold the heat there, and installed a damper in the flue pipe. His wife tried to light it once or twice, and on each occasion experienced a slight explosion which caused her to refuse to light it any more. Finally, one evening Mr. Dougherty (that was his name) came home and found his wife had been without any heat in the house for over three hours, and it was a cold day at that. He said, "Oh, there is no danger about that." He went to light it and found the gas valve had been left turned on. He shut it off but was afraid to light it immediately, and left it for a period of fifteen minutes. He then put a lighted paper in the inside of the firebox close to where the flame would naturally come up, and turned on the gas. It instantly lifted off the entire furnace top and scared the neighborhood to death. Going out there to look at it after the explosion had taken place, I found they had a damper in the flue pipe. If the latter had not been there the gas would naturally have passed into the atmosphere. I said three years ago if it were necessary to check the draft in any installation, check it where the air can get into it, but leave an outlet so any unconsumed gas could get out. I have not seen a domestic installation furnace, gas stove or water heater fitted with a damper that I didn't deliberately pull out the damper, for I know it is a dangerous proposition; it cannot help being one. I would like to hear from some one else on this subject.

MR. M. M. SWEETMAN: Does Mr. Mettler examine to determine whether or not the flue was stopped?

MR. L. B. METTLER: Yes; examined it and found it altogether open.

MR. M. M. SWEETMAN: Was there a hole through the center of the damper?

MR. L. B. METTLER: A 2-inch square one. It was the latest thing in dampers. Where I found it absolutely necessary to carry some check in the vent-pipe, I took the flue-pipe out where it enters the flue and inserted a brick, so there won't be an excessive draft. That would keep any inexperienced one from turning off the damper and would check that excessive draft.

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We have got that figured out to a very fine point in respect of water heaters. By adding a draft in the center or top of heater, we take care of any excessive draft, at the same time keeping the flue-pipe properly dried out, so that combustion can pass off into the atmosphere.

MR. J. F. OWENS: How are you going to make the draft accommodate itself to atmospheric influences?

MR. L. B. METTLER: Always have sufficient opening in your flue-pipe to carry off the unconsumed products of combustion. When you have the poorest draft then you are safe, and if you have too much draft up the flue-pipe you are not in danger.

MR. A. B. MACBETH: You do not install a damper in the flue of the water heater similar to that used by the Pittsburg Company. The burning of gas is a constant operation, and if one burns the same amount of gas whenever it is in operation, the flue takes off like amounts of combustion products; therefore, it is easy enough for anyone to adjust the flue to take care of the getting away of those fumes of combustion. However, in a furnace where you might be burning 20 feet an hour or 200 feet an hour one has a different proposition, and one must have a varied outlet. No damper, I think, should be used that can completely close the flue, because if it did it would put out the fire, and I believe that in any water heater a damper should not be put in the flue. The products of combustion from a water heater — I am not speaking of the Pittsburg water heater, but of water heaters in general—the fumes of combustion are more dangerous than from a furnace, because the gas is turned against a comparatively cold substance and is not completely burned.

MR. G. W. BARNES: Regarding how to control it without the damper, he speaks of having an outlet for air in the chimney to the extent that would over draft it. I fail to distinguish between the two effects; that is, using a damper to control it to a certain extent by a mechanical appliance by making it revolve. In a great many of our houses different conditions exist, owing, apparently, to what we would term excessive draft, but it is really a subject of sluggishness in our condition. Tomorrow we might have a change of wind direction and our neighbor's

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house might turn our chimney upside down, whereas the following day we get it from the other way. He speaks of controlling it by letting in more air. It is only killing a bird in another way; you have the same effect. You cut your draft off one place and reduce your air or you make a hole in the pipe further on and check your air there instead of through your furnace, with equal effect on your furnace; and if you have the check-draft open, to allow the introduction of air through the chimney out of your cellar and in through your furnace, and turn on your gas and let it in there it would stay in your furnace just as well whether it was checked beyond the furnace by a break or hole in the pipe, in regard to the effect of it. I think a man would turn his damper. Where one uses a damper in the pipe, I would think one would naturally open up the damper before starting fire in it. I would make sure that the damper was open first. If I had closed my valve I would open my damper and wait awhile; but I wouldn't leave the damper closed and do so. In regard to the opposite condition, as Mr. Macbeth states, the comparison isn't at all the right one, and the one we should take into account, because a water heater works under entirely different conditions from a furnace. The latter must be suitable to yield to the variable conditions. It may not be turned just to a certain point and left that way. It must be regulated, and the solution of the entire matter is to intelligently place a flue damper that will always give some circulation; but still you must have (and to get the best results you are bound to have) control of your air as well as control of your gas valve, and as they must be adjusted, either directly or indirectly, I fail to find out the difference. A water heater is a different proposition.

MR. A. B. MACBETH: I would like to take exception to Mr. Barnes' remark, and that it does not make any difference whether the air is checked in the inlet or outlet or flue. It does make a difference, for if the air is checked in the flue, and it is too close, the products of combustion will gather and put out the fire, but that wouldn't happen if the check was under the grate and in the air inlet. In other words, if you burn up a lot of gas the products from which couldn't get out, the fire would be put out in the furnace. That has happened on many occasions.

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MR. W. M. WELCH: I didn't fully grasp the point that Mr. Barnes intended to bring out in the first part of his remarks, but I thing there is a vast difference between avoiding gases after combustion and checking the gas and the air before the combustion takes place. You want a certain amount of heat in your furnace. To do that you want to burn the minimum amount of gas, and to properly and economically burn that minimum amount of gas, you want to introduce the minimum amount of air. You can't check your air except by having it adjusted correctly. The conditions of ventilation and of flue have nothing to do with the question of combustion; these are entirely a separate matter. Your atmospheric conditions are not as heavy and the draft is not as wide open in your flue, and when your air is dry, and other conditions are good, the result of a good draft is shown. I think it makes a great deal of difference, and there is a great deal of difference between the two. I believe there should be a damper in all cases, especially with large furnaces; but I further believe, in a small stove piped to a flue in a room, that a damper is unnecessary, because the same conditions always exist, or with some slight modifications.

MR. T. B. JARVIS: Mr. Mettler is right over his directions respecting carefulness. I have been often called on the damper question only to find a closed damper. I have had it happen many a time, and I have had to find out how I could remedy that condition. I get a damper and bend it so when it closes one way it opens the other. Then you have an absolutely certain one; it is automatic. You do not have to take down the flue pipe to get the damper in. You can bend it and get it in the flue draft, in that way giving you absolute control of your flue pipe damper. If your damper is loose enough that the draft will control, it is just the same whichever way the damper swings. Just bend it a little, and keep on bending until you get it the proper size. Then you have good control of it.

PRESIDENT MCKENZIE: As I understand it, you bend it in a sort of S-shape?

MR. T. B. JARVIS: Yes; just bend it to leave one side open enough to take care of the odor; then, if one shuts the other opens.

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PRESIDENT MCKENZIE: Why not run a hole in the center? I don't see any use of a damper of that kind, for the simple reason, from the way Mr. Jarvis states the proposition, you don't accomplish anything in turning the damper, since you open it every time you close it.

MR. T. B. JARVIS: I have found dampers having holes that wouldn't check at all. You can't limit the hole in a damper to cover the conditions in all flues, but you can this other way.

MR. G. W. BARNES: I referred to undertaking control after everything left the furnace, not interfering in any way with that which is left. The point I wanted to get at is not to interfere with the mixer or anything in the air until after combustion had taken place; what the effect would be, after the combustion had taken place, of introducing the air beyond the combustible chamber or in it.

MR. M. M. SWEETMAN: I have an ordinary damper in my furnace, and I have taught my boy (he is only 9 years old) when in the cellar starting the furnace to light a match and hold it in front of the door at the small crevice and see whether the draft is going out or coming in. I have instructed him that in mild weather the ordinary damper can be shut off some, but that in cold weather, on a large consumption, the damper must be opened wider. I have had him come to me and say, "Papa, I opened the damper a little bit, I put a match up there and it blew it out." If you can teach a 9-year-old boy I should think a man or woman of average intelligence could handle an ordinary damper, and a damper should be in the flue.

MR. J. P. STRICKLER: As a gas man, I can't say I would advise not to put in a damper. My idea is that each separate installation should be studied by itself; perhaps in no two houses should the installation be identically the same. Location of furnace and draft from it, and location of flue in relation to the house adjoining it, are all things that should be taken into consideration. One day the wind direction will interfere with your drafts, but the next day, when coming from the other direction, you will have a good draft. All those things and more should be taken into consideration. I would not advise anybody to put in a house an installation of any sort without a damper.

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MR. L. B. METTLER: This is such an important subject to my mind, that I can't stop here at all. I want to refer you here to Sketch "C" in Mr. Hurlburt's paper. If I were putting in an installation in a furnace, that would be the kind that I would install. I would close that off entirely so no air could get into the furnace save through the air mixer. I would see to it there was no excessive draft in the flue pipe, but that it had an opening large enough to carry off any draft that was made by the heat of combustion. I would also see there was no draft in this flue pipe through the furnace, and then when I lighted my furnace it would create a heat. There should not be any more draft pulling that heat out than what the heat itself creates. There is where you begin to get economy out of the gas. There are too many of these furnace installations in which the flue or draft pulls the heat out or hauls the cold air in at the bottom of the furnace, that actually cools off the furnace or the heat that is created by the burners — actually cools it off. The only air to get in it should be that which mixes. If there is excessive draft in your flue there should be a hole cut in below it. There is a certain amount of water in each cubic foot of gas, and that is one of the features to be guarded against. In the flues of any old mansion, that water dampens the brick and plaster naturally falls down. I have gone through many a flue pipe to find the entire thing saturated with moisture, and I have had the pleasure (?) of taking two barrels of old ashes out of that flue pipe that had stuck on its sides for a number of years. The water in the gas caused it to break loose and fall to the bottom. You have the wrong idea if you think you have to pull your air up through the furnace. No air should go in except what goes through the mixer, and you get real economy out of it, and the only draft necessary is that naturally created by the gas or heat itself. The excess gas and fumes, if any, must be carried off, of course, but you don't want anything in your flue pipe that would hinder its passing off, and still you do not want to pull any air in that would cool off the heat created by the burning of the gas itself. I hope I make myself plain regarding that. The President in his address speaks about there having to be better piping arrangements or the price of gas is going up. A thing to which

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we have to come is to better the conditions under which these furnace installations are made. There are lots of them in Kansas City, and the majority of them cause too big a gas bill. I have several friends whose heating plans I looked over and then changed their arrangement by closing up the draft pipe so that air could get in only through the air mixer at its bottom, and it was done with very economical results. (Applause).

Mr. J. F. OWENS: Another point to which it seems to me we ought to give a little attention, but to which the Association hasn't paid much thought, is the question of the quantity of gas demanded for different installations. For instance, say a 6-room house. Is there any rule by which you can arrive at the amount of gas you will need to heat the house? Three considerations enter into it; the size of pipe to be used; the sort of burner to be used in making the installation or the size of the stove; and the size of the meter to be installed. I would like to have some information respecting these things.

MR. G. W. BARNES: I don't see how it would be at all possible to arrive at any conclusion as to the size of the installation or amount of heat required to heat a 6-room house. It seems to me there would be a vast difference in houses.

MR. J. P. STRICKLER: The size of the room would have a great deal to do with it.

MR. G. W. BARNES: Say a room, 14 by 14.

MR. C. W. SEARS: You cannot regulate it at all, as the arrangement of your room wouldn't be the same.

MR. C. D. BELL: I believe the only way a person can determine what to put in for a customer is to study what kind of a family he has and how he lives. Although in the business about 25 years, the oftener I look at a man the more I find out about him, even to telling how much gas he is going to use in a house, whether it is a 10 or 3-room building. I have had a great deal of experience. I always try to get the installation large enough, then I am satisfied that I will satisfy him.

MR. J. F. OWENS: I understand it is impossible to get a hard, fixed rule. That is not what I wanted. I just wanted to get the ideas the rest of the gas men of the country had in regard to that.

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MR. L. B. METTLER: One more remark with reference to the sizes of pipe and meters for a certain sized house. There were, approximately, 50,000 in Kansas City, Mo., using gas or burning it, and it was absolutely impossible to supply each house with so much for each. A thousand installations were being put in by plumbers, and it was necessary that we adopt some rule. We didn't even know how long those pipes from the meter to the furnace were to be, and that length has everything to do with the size of your pipe; so it is necessary, almost imperative, to designate the size of pipe that should be put in, so we gathered the best information we could and struck a general average.

MR. K. M. MITCHELL: I don't want to monopolize this discussion or prolong it, but I wish to take exception to what Mr. Mettler said about having no air except that which comes through the bottom of the burner. Would not that send the draft down on the burner?

MR. F. W. STONE: At the same time, gentlemen, Mr. Mettler's idea as to the proper way to check the draft is nearly right.

PRESIDENT MCKENZIE: You will admit that, Mr. Mettler? (Laughter).

MR. F. W. STONE: That, is generally, very good. It is quite possible, in a large number of installations, that one may need a damper in the pipe. At the same time, it will be found that you can get a more automatic, sensitive draft by having an opening either in the chimney or in the pipe so that a small amount of air is going up the flue all the time. Some years ago in an experience with a gas appliance we found we couldn't regulate the draft of the burner accurately by means of a damper; that is, we couldn't make it sufficiently sensitive. So we put in a pipe 5 feet above the burner, and set a hood over that pipe, which procedure we found sufficient to provide whatever draft we wanted or needed to properly regulate it. Your damper should be an opening or check-draft in the pipe, and when the suction varies, by reason of change in the wind or atmosphere, it takes it out of the cellar, carrying it up in the pipe instead of making an excessive pull on your furnace. It helps to regulate the draft and also provides plenty of air going up the chimney.

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which helps take the moisture outside instead of having the chimney moist and not dry. [Applause.]

PRESIDENT MCKENZIE: On account of the press of business, we will have to bring this discussion to a close.

MR. K. M. MITCHELL: Will we resume it tomorrow? It is of considerable interest to all of us, and we ought to continue it.

PRESIDENT MCKENZIE: If we can get the time we will continue it.

MR. K. M. MITCHELL: I want to say that I believe, as Mr. Hurlburt said, a damper should be placed in this flue, which should, however, not completely close the stack, and, in cases of furnaces, this should be placed between the check-draft and the furnace. All consumers should be warned against flues becoming stopped up, etc. I think a damper is absolutely necessary, and I think, as Mr. Sweetman said, you want to attend to your damper judiciously, always seeing to it that the damper is at all times adjusted properly. You can't put a damper in a flue and have it remain stationary. It needs to be adjusted occasionally. I have great regard for the experience of Messrs. Stone and Strickler, and I think that Mr. Stone spoke of a disconnected flue pipe. That is all right, but it is particularly applicable to water heaters or where large amounts of gas that are being burned are not passed from the chimney, but are liable to blow down and blow the flame out. I want to call attention to another section of Mr. Hurlburt's paper, in adjusting the attaching of a hot air drum to the air furnace—an auxiliary installation for burning gas only. We have a number of these installations in operation in St. Joseph. I have one in my house where we attach a regular gas furnace to the side of the hot air furnace, don't disturb the latter in any way. We simply attach the combination furnace alongside of the jacket of the hot air furnace and, in case of low pressure or accident to the gas supply, all we have to do is simply throw coal into the regular furnace. I would call attention of gas companies to the advantage of paying attention to this and even, if necessary, spending a little money to having as many of these installed in the hot air furnaces as possible, for they are a decided advantage in case of a

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breakdown or a shortage in the supply of gas. I made a little sketch of the idea, showing the attachment on the side of the gas furnace. You undoubtedly have heard of it. There are various patents and designs of the idea, but I would recommend this as being a great help to the gas man.

MR. E. W. SINCLAIR: I would like to ask about the heat from the gas in that arrangement?

MR. K. M. MITCHELL: It is put in the air space of the drum up near the top.

MR. E. W. SINCLAIR: Radiation of the coal furnace?

MR. K. M. MITCHELL: Yes. You simply cut out a space for the heated air that comes from this auxiliary heater, and it goes right into the furnace. You don't disturb your air furnace at all.

PRESIDENT MCKENZIE: Mr. Sears, do you care to say anything to end this discussion?

MR. C. W. SEARS: I think, from what I know of the conditions in Kansas City, that there is a great deal of good information in Mr. Hurlburt's paper. I can't say I differ particularly with him on any of those points. Some things I do differ with him, but not in a really material way. I think, in fact, am quite sure, that in the main perhaps a damper is absolutely necessary, with the exception of the instantaneous heater. There I keep it out entirely.

SECRETARY JONES: That's right.

MR. C. W. SEARS: I would put in a damper, not closing it up completely, but so it would permit of carrying off the fumes. It might be well for the chimney sweats (and you will have trouble along that line) to open the flue below the chimney, as Mr. Mettler and Mr. Stone have stated, but I don't know that I can say any more to the paper. [Applause.]

SECRETARY JONES: I move that a hearty vote of thanks be extended to Mr. Hurlburt for his very valuable paper.

The motion was put by the President, severally seconded and unanimously carried.

PRESIDENT MCKENZIE: The next paper on the program is Iron vs. Tin Meters, by A. G. Holmes.

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IRON VS. TIN METERS.

A. G. HOLMES.

The writer fully appreciates the honor conferred in being selected by the Officers of the Natural Gas Association of America to write a paper on the subject of Iron vs. Tin Meters, and in accepting this very pleasant task, has assumed that it is not the intention of the Association that a history of the Tin Meter be given inasmuch as that has been the subject of previous papers by other writers, but a comparison of the merits of the two types of meters, the decision of the matter to be determined by the users of the meters after hearing or reading the paper and its discussion, which latter it is hoped by the writer and no doubt by the Officers of the Association will be participated in by a large number of those present.

It has, however, occurred to the writer that a detailed description of the Tin Meter as well as the Iron may be of interest to the members, not only those who hear the paper, but also those who may perchance read it, before or after the meeting, and it has seemed best to follow the course of the gas through the meter from inlet to outlet, taking up each part and the office it performs.

Tin Meters of the present form have been made in the U. S. for the past 50 or 60 years and without material improvement except as to increased capacity and the art of manufacture. Illustration No. 1 shows the exterior view of a regular Tin Gas Meter, the parts of which are known by the following names:

No. 1. Top.
2. Front Gallery Plate.
3. Back Gallery Plate.
4. Front Case.
5. Back Case.
6. End Plate.
7. Bottom.
8. Index Box.
9. Index Box Cover.
10. Name Plate.
11. Dial Glass.
12. Union Nut.
13. Plain Swivel.
14. Threaded Swivel.

Illustrations Nos. 2, 3 and 4 clearly show the interior construction, the parts of which are as follows:

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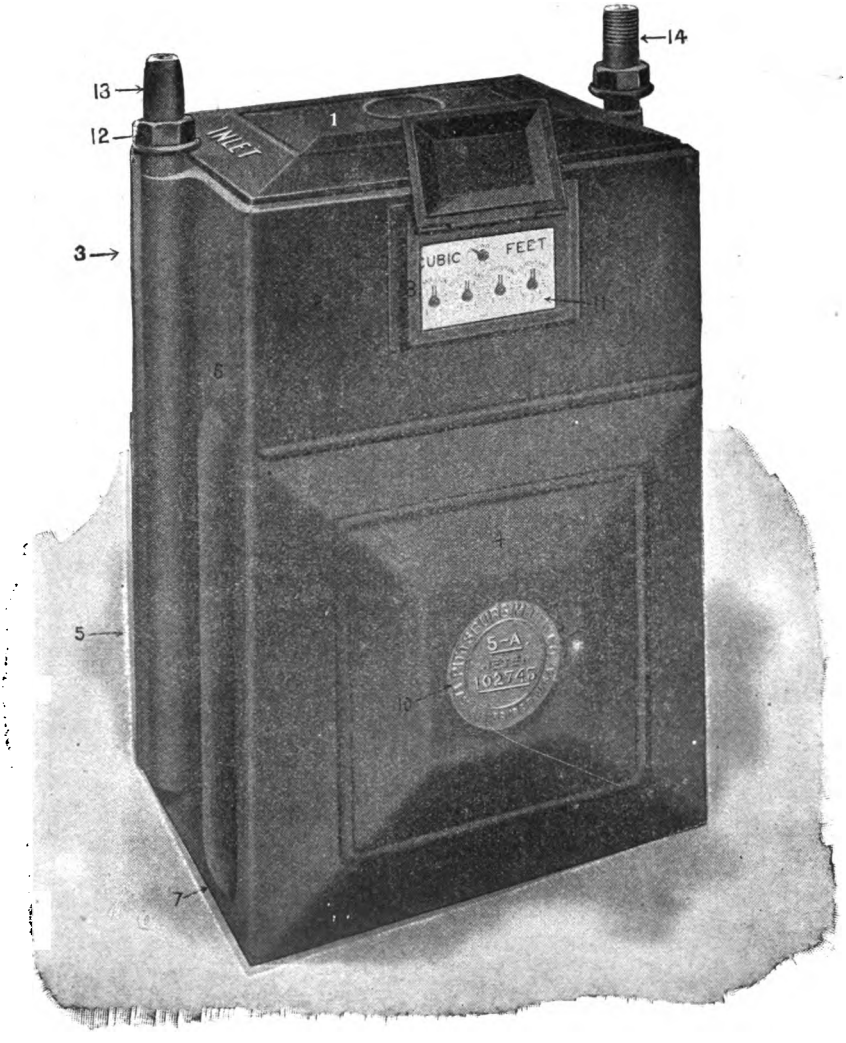

No. 1.

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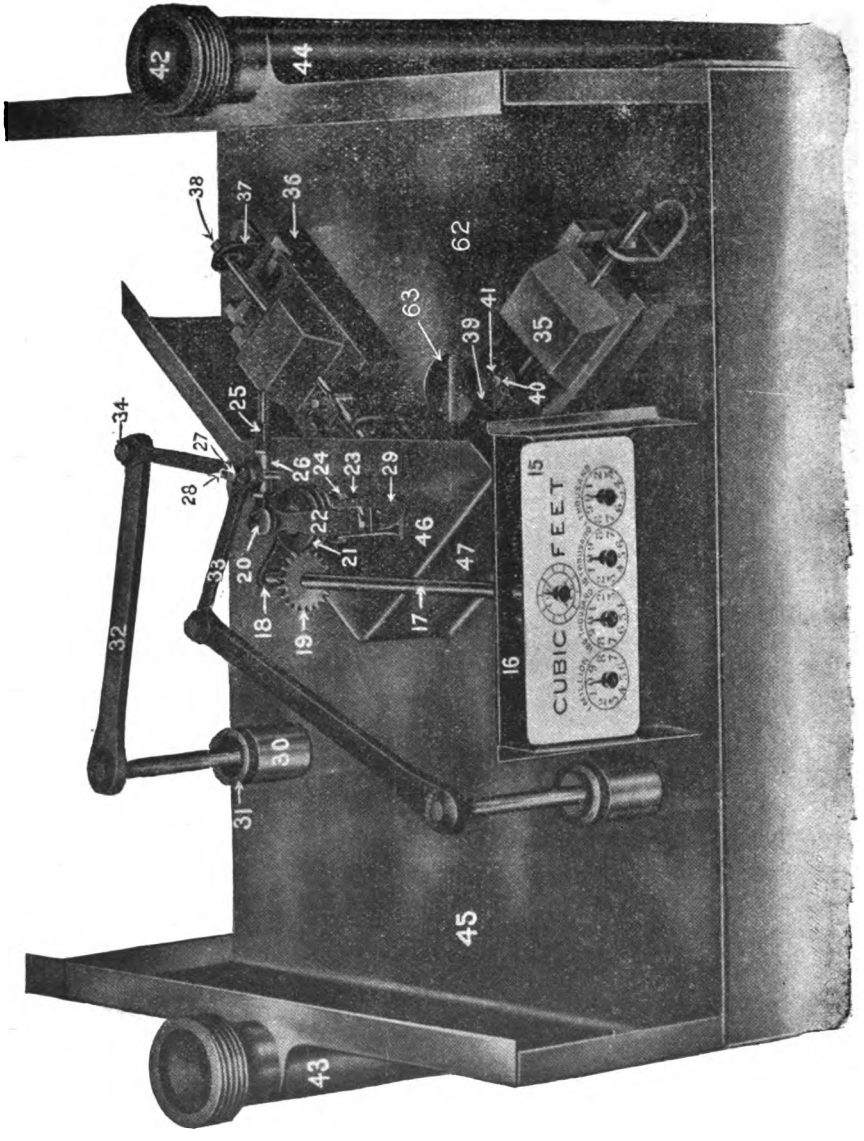

No. 43. Inlet Pipe—Illustration No. 2.

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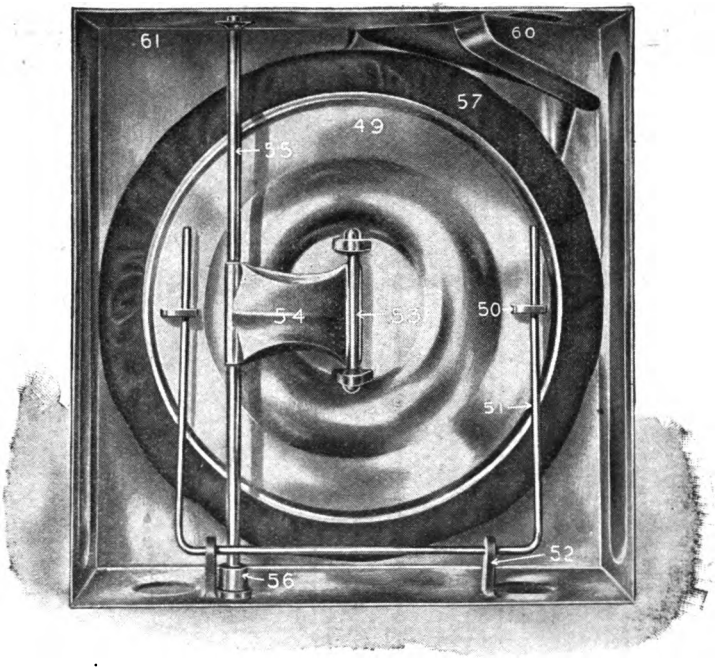
15. Dial Only.
16. Index, Complete.
17. Horizontal Axle.
18. Horizontal Axle Bearing.
19. Horizontal Axle Wheel.
20. Crank Shaft.
21. Crank Shaft Worm.
22. Crank Shaft Top Bearing.
31. Flag Wire Stuffing Box Cap.
32. Flag Arm.
33. Flag Arm Link.
34. Flag Arm Post.
35. Valve.
36. Valve Seat.
37. Valve Guide.



No. 3.

23. Crank Shaft Stuffing Box.
24. Crank Shaft Stuffing Box Cap.
25. Tangent.
26. Tangent Nut.
27. Tangent Post.
28. Tangent Post Pin.
29. Backstop.
30. Flag Wire Stuffing Box.
38. Valve Guide Wire.
39. Valve Link.
40. Valve Post.
41. Valve Post Pin.
42. Meter Screw.
43. Inlet Pipe.
44. Outlet Pipe.
45. Gallery Bottom.
46. Crank Shaft Plate.

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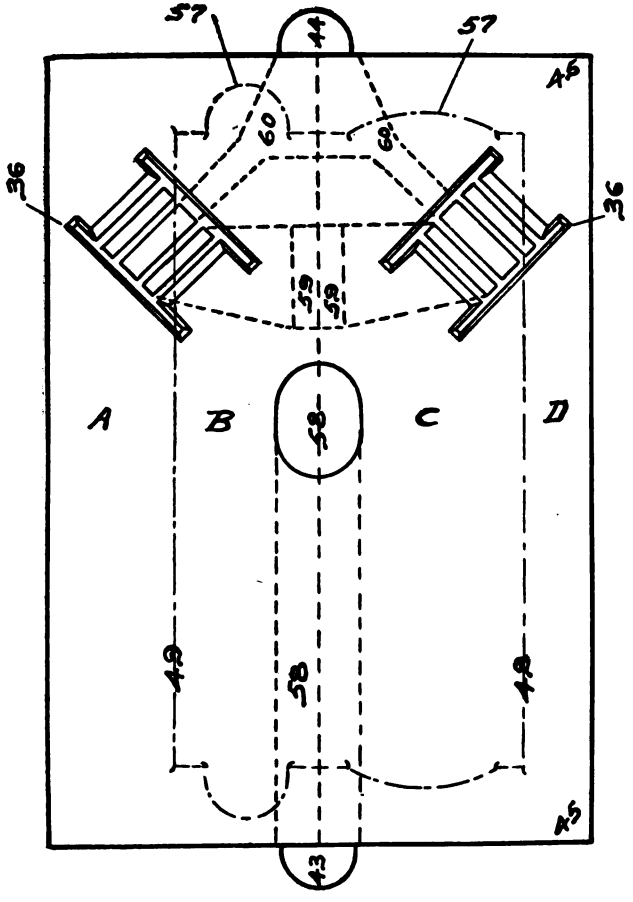
47. Valve Chamber Front.
48. Valve Chamber Cover. (Not shown.)
52. Guide Wire Bearing.
53. Rocker Shaft, Complete.
54. Flag.



No 4

49. Diaphragm Disc.
50. Disc Guide.
51. Disc Guide Wire.
55. Flag Wire.
56. Flag Wire Step Bearing.
57. Leather Diaphragm.

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58. Inlet Channel.
59. Diaphragm Channel. (Not shown.)
60. Outlet Channel, Complete.
61. Partition.
62. Valve Chamber.
63. Inlet to Valve Chamber.

Referring to Illustrations Nos. 1, 2, 3 and 4 and assuming the meter and lines are full of gas and an outlet or opening has been made in the consumer's house, gas entering at 13, Illustration No. 1, from the Company's main passes through the meter screw, into and through a channel 58 attached to the underside of gallery bottom 45 into the valve chamber 62 by the opening 63, Illustration No. 3, into the four compartments made by the two diaphragms 57, the partition 61, Illustration No. 3, and the front and back case 4, Illustration No. 1. The difference in pressure caused by opening the house valve causes the diaphragms 57 to expand and contract, thereby moving the valves 35 to and from the center by the movement of the flag 54, the flag wires 55, flag arm 32 and flag arm links 33, thereby rotating the tangent 25 and crank worm 21. The worm 21 in turn revolves the horizontal axle wheel 19 which communicates its motion to the clock or index 16, the amount so passed being registered on the dial 15.

Under each valve or cover is a seat 36 having three openings, one to the inside of the diaphragm, on the side on which the seat is located, by the channel 59, one opening to the outsire of the diaphragm directly through the gallery plate 45 and inside the outer case, and a central opening to the outlet of the meter by the channel 60 to the outlet pipe 44.

Illustration No. 5 shows a section of the valve A from which it will be clearly seen that it is hollow on its underside, which hollow space is of sufficient area to cover one of the inlet ports C or C′ and at the same time part of the outlet port B which will be noted always gives free valve area. In this position gas is passing from one of the compartments under valve C to the outlet B in the seat, thence to the outlet of the meter by way of the channel 60 and outlet pipe 44, Illustration No. 4, at the same time gas is passing into the other compartment through the other opening of the valve seat C′. (Illustration No. 5.) This opening C′ (not lettered) can also be seen in Il-

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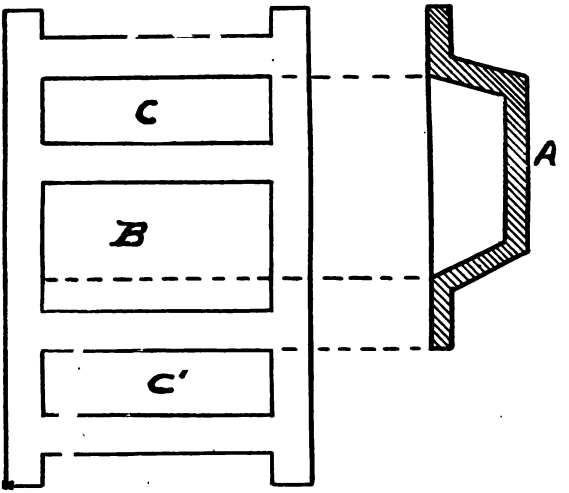
lustration No. 2 near 36. The inlet pipe 43 serves to collect condensation, etc., while part of the outlet pipe 44 serves the purpose of communication between the outlet channel 60, Illustration No. 4, and the meter connection. These pipes 43 and 44 may when desired be made much shorter.

Adjustment is made by either shortening or lengthening the stroke by the tangent and nut 26.

No gas is supposed to be present in the gallery between the top 1, Illustration No. 1, and the gallery plate 45, Illustration



No 5

No. 2, except in what is known as the open top meter in which gas enters the gallery direct from the pipe 43 and in which the valve chamber cover 46, 47 and 48 is eliminated.

In the regular Tin Meter, a stuffing box is provided at 30 on each side and at the under end of the worm at 23. In the open top Tin Meter, the stuffing box at 23 is eliminated and one placed at the back of the index 16; the stuffing box spindle in the open top meter travels much slower than in the rgular meter at 23 and can therefore be made more permanent.

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In Prepayment Meters an attachment is made whereby a coin releases a certain amount of gas, to the value of the coin, by a series of wheels which alternately release and close a valve in the Prepayment Attachment.

The tin parts of these meters are usually stamped from sheet tin by powerful presses and the valves, seats, etc., cast in metal moulds from white metal—the valve and seat being of different mixtures.

The diaphragms are made from full sheep skin, first cut in strips and these strips sewed together—the stitches not going through the leather on either side, the leather ring thus formed is attached to a tin ring on either edge; these rings are in turn soldered to the partition 61 on one side and the diaphragm disc 49 on the other. These diaphragms are supported by the flag 54 which is rigidly attached to the flag wire 55.

The motion of the diaphragms is on a straight horizontal line at right angles to the partition.

The valves used in Tin Meters are known as D slide valves and are admitted by all engineers to be absolutely the best form for gas meter purposes.

At the time of the introduction of natural gas into Pittsburg about 1880, Tin Meters of regular make were used, for sometime, to measure the domestic distribution and when made of heavy tin and carefully soldered joints would, when new, safely withstand working pressure of about 5 to 10 pounds but would bulge on higher pressures. The worm stuffing box, however, was and still is the greatest obstacle to using them on pressure of more than about 4 ounces and for this reason particularly the attention of manufacturers and inventors was, about the year 1886, given to the matter of a suitable gas meter with cast iron or steel outer case because excessive leakage was liable to cause not only great damage to property but loss of life as well. It was therefore considered advisable to use meters of stronger construction such as cast iron on account of the uncertain pressure and due to unfamiliarity with the natural gas business. No meters of this kind being available in the open market, the Fuel Gas and Manufacturing Company, a Westinghouse corporation. later succeeded by the Pittsburg Meter Company, developed and

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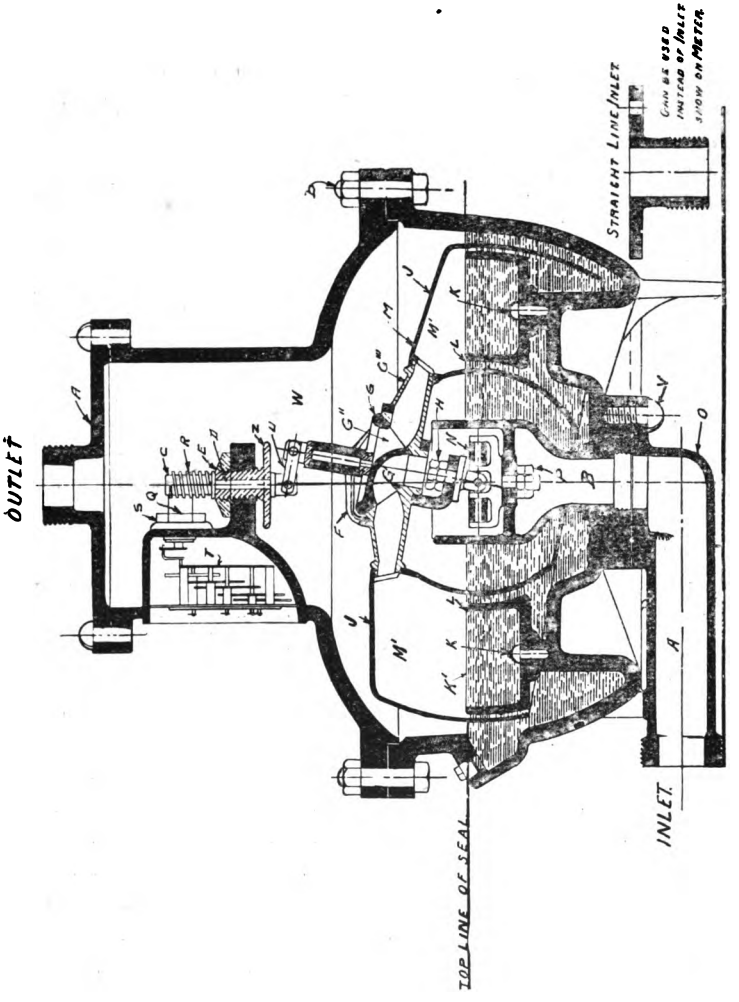
manufactured the Westinghouse Fluid Meter which was put on the market about 1887 in sizes ranging from 200 ft. to 40,000 ft. per hour.



No. 6.

Illustration No. 6 shows this meter in section, its operation being as follows: Gas entering at A passes up through the center cup B through the valve section G''' under the inlet of the

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valve G to the compartments M′ between the fluid K′ and the top of the drum M. A difference in pressure being created between M′ and W, the drum mutates on the universal joint N causing the valve G to revolve, bringing its inlet G′ and its outlet G″ alternately in communication with the six ports of the valve section G‴ thereby filling and emptying the spaces M′. The motion of the drum is communicated to the register by the link U, worm R and worm wheel back of R (not shown.)

Adjustment is made by lengthening or shortening the swing of the drum by lowering or raising the shaft D by means of the adjustment wheel or disc Z, it is then locked by the nut E.

The seal in this meter performs the same office as liquid in a gasometer preventing gas from passing around the outside of the drum M. This meter when properly used is very durable and accurate, and on account of its durability is especially desirable in Proportional Meters as a tally.

In a short time, dry gas meters with cast iron casings began to appear on the market and largely superseded the liquid meter, owing principally to being more convenient and lower in price; they are, however, not as accurate as the fluid meter. Several forms were consecutively put on the market, the life of which varied, probably the first being known as the Metric made at Beaver Falls, Pa., under patents of Culmer, June 3, 1890. This is a one diaphragm single acting meter, a weight being used to carry the diaphragm over the center. Probably the next on the market was the Tobey, made by the same company under patents of December 13, 1892, by Dr. Tobey, then of Toledo, Ohio. This meter consists of three diaphragms and a rotary valve, and is single acting.

After these came the Equitable, a five diaphragm single acting meter adapted after the Carbureter patent of Hyams, March 3, 1880. The Sprague one diaphragm single acting meter of 1895 patent, which used a spring to carry its diaphragm over the center, the Keystone under patents by Pudam, January 17, 1894, the Sprague two diaphragm meter with three compartments, and a rotary valve patented March 10, 1903, and the latest, the Ironclad, patented September 7, 1909, a two dia-

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phragm double acting machine with two D slide valves, the same as used in Tin Meters.

Messrs. Henly and Fulgham of Richmond, Indiana, made a few meters under their patent of October 23, 1894, a two diaphragm double acting machine with a rotary valve, but few were made and it is now practically unknown.

What has been needed for twenty years and no doubt has been aimed at by all inventors and manufacturers is a two diaphragm, double acting cast iron machine which can be made at a marketable cost, and include the features found only in Tin Meters, viz., sensitiveness on small volumes of gas and large capacity with slight absorption of line pressure, combined with durability and low cost of maintenance. Some of these features have been secured to a certain extent in perhaps one or two of the cast iron meters on the market prior to 1908, but unfortunately they have been lacking in one or both of the most important features, viz., sensitiveness and large capacity with slight absorption of pressure; however, in the spring of 1908, a cast iron dry meter of two diaphragms, double acting, with two D slide valves, was put on the market which not only includes all the desirable and essential features of the Tin Meter, but has a cast iron outer case and is so simple in construction that its maintenance is practically nil. While this meter has probably become better known in a short time than any meter ever offered the gas trade, a brief description of its construction and operation will, I trust, be interesting to the members of the Association.

It is made up of five principal parts, of cast iron, (Illustration No. 7) viz., top or case cover 1, register box 2, front and back cover 3, and main or center case 4, all similar in purpose to the same parts of the Tin Meter.

Illustration No. 8 is an exterior view showing all the outer parts including the loose connections, seal wire, seal, etc.

The interior working parts are shown in Illustration No. 9 and are so nearly like those of the Tin Meter that a detailed description seems unnecessary except to mention that the inlet is in direct communication with the valves, the channel and valve cover necessary in a regular Tin Meter having been eliminated,

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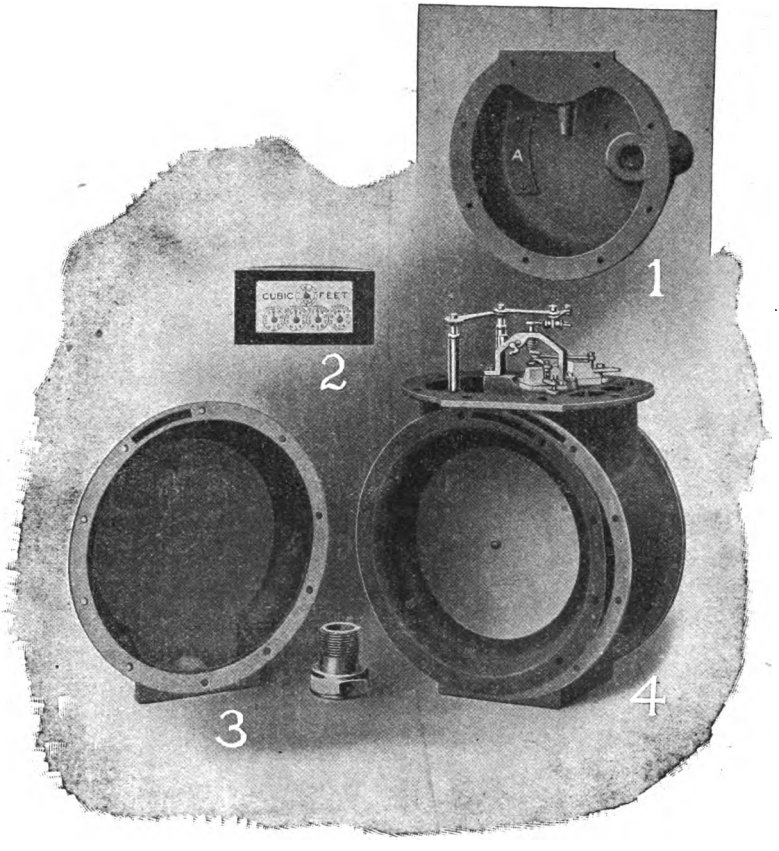
there is, however, no chance for leakage as in an open top Tin Meter.

The course which the gas takes through this meter is identical with that of the Tin Meter and the adjustment is the same



No. 7.

but it will be noted by Illustration No. 9 that what corresponds to the flag 54, Illustration No. 3, in the Tin Meter is on the inside of the diaphragm in this meter in place of on the outside as in the Tin Meter. The flag in this iron meter is supported by an arch, Illustration No. 9, whereas in a Tin Meter the flag

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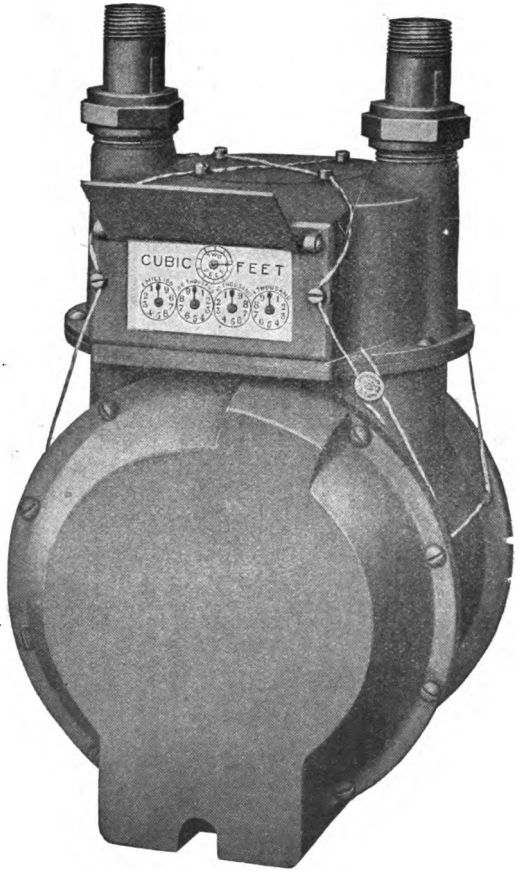
itself carries the diaphragm. This is a decided and very important improvement, inasmuch as it permits removal of a diaphragm without any interference whatever with the flag and eliminates the flag wire bearings found in Tin Meters. In place



No. 8.

of requiring the services of an expert tinner to remove the diaphragm, it is only necessary to remove a small nut when the diaphragms and diaphragm tins or discs can be readily removed from the flag.

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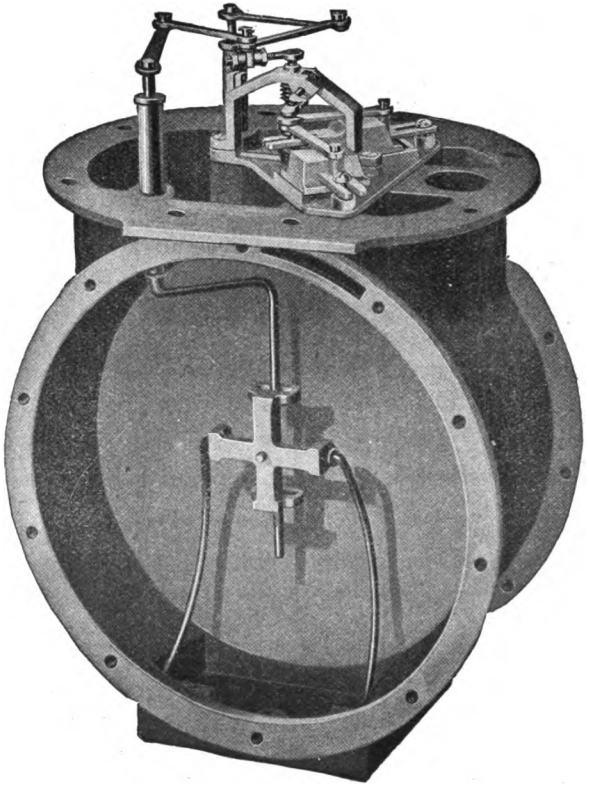
The simplicity of this iron meter is clearly shown in Illustration No. 9 in which the front and back cover, diaphragm, case cover and register box have been removed, leaving the entire working parts of the meter attached to the center case, in other words, to gain access to the working parts and without taking



No. 9.

them from the meter it is only necessary to remove the outer castings, and while this is a very simple matter to the meter repairer, it cannot be done by the consumer because suitable seals are provided to prevent it. This form of iron meter is particularly well adapted for a Proportional Meter Tally when a dry meter is desired.

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While the foregoing may not appear pertinent to the subject of Iron vs. Tin Meters, it has seemed to the writer necessary to outline the principles and make-up of at least one of each kind in order that an intelligent comparison may be made.

For many years the Tin Meter has been the standard for the measurement of any kind of gas provided conditions were such as to permit of its use, and it has been the standard because in selecting a meter, the gas man should always consider at least two important features, viz., capacity with a given drop of pressure and sensitiveness.

Capacity, without considering drop of pressure, means nothing whatever except perhaps to those who want to drive their meters at a certain speed without any reference to accuracy and the life of the meter and without reference to the amount of line pressure the meter is absorbing, but when the time comes that any amount of pressure is not available, the gas man must then consider absorption of pressure whether he cares to or not and it has been demonstrated in the past twenty years of the natural gas business that this time comes to practically all Natural Gas Companies. The wise man, therefore, considers it in the first place.

On June 12, 1906, the writer read a paper at the first Annual Meeting of the Natural Gas Association of America at Kansas City, Mo., on the subject of Gas Meters for Domestic Consumers in which he upheld the Tin Meter. After four years he would still be of the same opinion provided nothing had been produced to equal or excel the Tin Meter, but that has been done by the Iron Meter referred to, for both natural and artificial gas and what was then said of the superiority of the Tin Meter over Iron Meters can now be said of the cast iron meter referred to herein over other Iron Meters and the Tin Meter with one exception, i. e. the Tin Meter is lighter and therefore easier to carry about, on the other hand, this iron meter is stronger and safer so that it really excels the Tin if it includes all the good features of the Tin, which it does. In the discussion of the writer's 1906 paper, the speed of the Type A Tin Meters was commented upon—after four years the writer can say the Type A is a decided success and as this Iron Meter is

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not faster in operation, notwithstanding it could be, owing to its rigid construction, it must also be a success.

The decision of the question, Iron vs. Tin Meters seems to resolve itself into a consideration of the objections to both types from the natural gas man's standpoint, especially as far as this Association is concerned and I venture the following objections may be made to Tin Meters by the average Natural Gas Company Manager:

First. — They are not strong enough to constantly withstand the average natural gas pressure for a reasonable length of time.

Second. — They cannot be set up with stiff iron connections without great care.

Third. — The tin will corrode, especially when it is dinged or set in a damp place.

Fourth. — They require an expert meter man to repair.

Fifth. — Unless especially made with extra heavy working parts they will not stand up against the extra work due to large consumption of natural gas as compared with artificial gas practice.

Sixth. — The connection screws are too easily pulled apart.

Seventh. — They cannot be set outside the consumer's house.

And the following objections to an Iron Meter provided it is equal in every respect to the Tin Meter as to the Gas Company's requirements:

None.

PRESIDENT MCKENZIE: Gentlemen, you have heard the reading of this excellent paper. Is there somebody that wants to take it up and discuss the questions or discuss the features of it?

DISCUSSION.

MR. J. D. MCILHENNY: Sitting here, with that plant between me and the President, I hoped he would overlook me in respect of responding on this subject. The fact that we make tin meters would naturally induce me to speak in a general way, so that there wouldn't be strong objection on the ground of talking of personal business matters. As pointed out in the paper, tin

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meters were made first, and I think it is always worth while to look up installations upon any subject. The present type of tin meter is one which succeeded, after many trials of other types in England, where artificial gas was first established, and from the first to the present type of tin meter these are essentially the same as those made today. The man who first invented it was truly a genius, and he anticipated the conditions which have largely been encountered since; of course, minor improvements have been made, but in principle the meter is the same. In England that meter came to be the standard, and was so finished when artificial gas was first introduced in the United States. Also, cast iron meters have been made for 30 years or more, which are about the same as the tin meters; in other words, a tin meter with a cast iron case. For some reason, English companies have largely abandoned the use of the cast iron case as applied to artificial gas. As to all the reasons why they have not used the cast iron case there instead of the tin I cannot tell you, but I would suggest that possibly those reasons would have applied, and they will also apply largely in this country and, as I will try to show you later on, largely to the natural gas as well. In the first place, the form of construction is more expensive than in the tin meter, and if the same object can be accomplished at less expense we naturally take to it. I think also that would apply in the present instance. Another reason is weight, which makes it that much more difficult to handle. In natural gas I can appreciate that at times the cast iron meter would have preference because of the locations in which it might be placed. The natural gas business deals with small communities that necessarily have not artificial gas, and the conditions are such that meters might have to be placed out of doors or in other exposed places, so I can readily realize why the heavy form of cast iron meter would not be suited to the conditions. With artificial gas, another objection to the cast iron type, which I believe has led to the non-success abroad, is that various forms of congestion prevent the old, oily meter from oil working into the meter through the joint that naturally works upon two hinges; and the gas escaping through it, as far as the gas and oil are concerned, without any such joint would be more apt to hang at this

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oily congestion, when in the solid joint of the tin meter it will find resistance. In that connection I will say there is a tendency today, both for artificial and natural gas, to insert within the meter case a certain quantity of oil. In artificial gas there is a certain quantity of it; also in some forms of coke oven gas, where the gases are admixed with benzole in order to bring out the candle power, the light oils are carried off, making it dry. In any natural gas, as I understand it, the compression of the gas for sending it greater distances is constantly increased, and in the actual act of compression the oily features, which frequently accompany natural gas, are cast out, so that when the gas is distributed it is dry and has a drying effect upon the diaphragm. In order to overcome that, both for artificial and for natural gas, a certain quantity of oil is introduced in the meter case, so that the lower part of the diaphragm rests in this oil, which keeps the lower end moist and in proper condition for work. There is also a very great objection in having oil in the top of the meter, for it will get on the valves and help to lubricate them. I will have to say for the gas meter that, taking into account the conditions under which it has to work, I think no other instrument for measuring has done its duty as well or as accurately as a gas meter. If it rests in a cellar on a platform it is working without attention, without repairs, for a number of years. I believe if you will take 100 of the best watches, starting them at the beginning of a year, and then take an equal number of gas meters, the latter would show a better average of accuracy than would the watches. This is a slight digression, however, from the subject. I believe I made myself clear on the question of distillation of oil near the valves and the effect of heat and dry gas on the diaphragm of cast iron meters, which would cause the leakage of gas, and, of course, would be a disadvantage around the premises. The early styles of tin meters were made to measure gas at its minimum, and when I first went into the establishment with which I am now connected that subject was up. I remember Mr. John Young, of Allegheny, coming to my room to discuss the question of meters, and I believe they were then running the first meters used for measuring metric gas. That was many years ago, and, as far as I know,

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those meters are still doing good service, which is a very honorable record. When in the Patent Office in Washington some years ago I saw models of the early types of gas meters, and it was remarkable to note the various types that were brought out years and years ago. In the process of development of meters for measuring natural gas many of those same ideas have been adopted. So I think that, in the long run, it will be found that the type of tin meter, which has stood the test of time for measuring artificial gas, and which, as the writer of the paper has stated, will absorb the highest amount of pressure in the passage of the gas and meet all the conditions best, will be found the best. (Applause).

PRESIDENT MCKENZIE: Mr. Wallace, we would like to hear from you on this subject, if you have had some experience to give us thereon. Come up front, please.

MR. R. D. WALLACE: I haven't had much experience with the tin meters, my experience having been with the ironclad ones. so I cannot say from experience that they would run accurately in the last three or four years. Previous to that they would run fast, but for the last two or three years we have not had any of that trouble.

MR. A. B. MACBETH: Have you had any trouble with diaphragms drying?

MR. R. D. WALLACE: No; not for the last two or three years. Previous to that we did, as stated before; but in the last two years we haven't had any trouble of that sort at all. Another thing about the iron meter that should be seen to is, when you set it out in the sun the oil runs out of it and leaks around its sides, or else the oil runs out and then the meter leaks and has to be tightened up. It would probably be well to have a little discussion on this, with a view to obtaining a remedy.

PRESIDENT MCKENZIE: Can anyone answer Mr. Wallace's question with regard to that proposition?

MR. A. G. HOLMES: Perhaps the best way to avoid that would be to set the meter inside or cover it up with a box so that the sun won't get at it. Such experience as that complained of will be detrimental to any meter, whether it be iron or tin.

PRESIDENT MCKENZIE: Mr. Garard.

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MR. J. M. GARARD: I can't tell you just why, but I am an iron meter man. I do not know anything about artificial gas, since all my experience has been with natural gas. In the early days we wanted something that would stand the outdoor test, and we thought the iron meter would best stand it (we couldn't see but what it would register just as accurately as the other), so we started in along that line and have stuck to the iron meter all the way through. I haven't anything at all to say against the tin ones, because I know nothing against them. In so far as the registration between the iron and tin meters is concerned, I can't see there is any difference, from my personal experience.

PRESIDENT MCKENZIE: Well, don't you, in Columbus (O.) proper, use tin meters pretty generally?

MR. J. M. GARARD: No, sir; we use iron meters. The Columbus Gas and Fuel Company, I believe, uses tin absolutely, but we use the Tobey meter almost entirely.

PBESIDENT MCKENZIE: Mr. Strickler, give us some of your experience with the tin meter.

MR. J. P. STRICKLER: I would prefer not to say much, although a great deal might be said on this subject of meters. One reason I like the tin meter over the iron is that the latter requires a person to take care of it. Anybody with a screw driver can tamper with an iron meter. My experience with gas meters has been considerable, that being my work for fifteen years in connection with the company with which I am at present employed. In all the experience of our company I believe we have never at any time had an explosion that was caused through weakness of the case of the meter. With proper regulation and installation, I believe you need have no fear as to its security and ability to stand the pressure. I believe we have found the tin to be a little more regular than the iron meter. As I say, while I prefer to use the tin meter in general in our line of business, I have nothing to say against the iron meter.

MR. J. M. GARARD: I don't like Mr. Strickler's reflection on our city very much, in regard to the tampering with meters.

MR. J. P. STRICKLER: I was not referring personally to your company. (Laughter.)

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MR. A. G. HOLMES: In view of Mr. Strickler's remark, some defense should be made of the iron meter. When he says an iron meter can be tampered with, thus giving the impression that a tin meter cannot be tampered with —

MR. J. P. STRICKLER: No; I wouldn't say that.

MR. A. G. HOLMES: Well, it would leave that impression. I never saw a meter made that couldn't be tampered with —

MR. J. P. STRICKLER: No; nor I.

MR. A. G. HOLMES: —whether tin or iron, because it is very easy with an expert machinist to bore a little hole in a tin meter, then solder it and fix it so it could not be told that it had been tampered with.

MR. J. P. STRICKLER: The average consumer doesn't have that outfit, where they do have a screw driver.

MR. A. G. HOLMES: If the consumer wants to do it he gets the soldering iron.

MR. J. P. STRICKLER: That is so, too.

MR. A. G. CURTIS: Our meter situation resolves itself to the tin meter for the inside and iron meters for our outside installations, and we have a situation there (Shreveport, La.) that perhaps most of you are not familiar with. It is that probably 95 per cent. of our houses or residences are built up on stilts or blocks, and it is almost necessary to install our meter practically where it is outdoors. For that reason we like the iron type of meter, and find that it is to our interest (at least, that is our best judgment) to set it in front of the house. When it is in said situation it is almost impossible for people to do a "stunt" of any queer sort, if they were inclined to do so.

MR. J. P. STRICKLER: I would say again, that I think conditions, to a great extent, govern the requirements. For outside purposes, perhaps an ironclad meter is the meter, but for inside purposes, where they are protected and away from the elements, I think the tin meter is equally long lived. No meter is made that does not need attention, one way and another, in time. Even an iron meter, if set in a damp place, will rust out in time, and corrosion will take place and eventually rust it. Conditions have a great deal to do with the kind of meters that are required.

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PRESIDENT MCKENZIE: I would like to hear from anybody else who has had any experience with meters.

MR. K. M. MITCHELL: We have used a couple of sample iron meters, and our worthy President, when looking around for someone to write a paper for this meeting, wrote to me to know if I wouldn't take up the subject of iron meters. I suggested to him that Mr. Holmes be invited, as I hadn't the necessary experience in those matters and that as Mr. Holmes had he should be invited to write a paper, for he was a manufacturer of both iron and tin meters. I think the gas meter is one of the greatest inventions ever made. As it stands today it is almost impossible to improve upon it. The iron meter described in this paper is simply an iron case around the old meter, with the exception of the bed of the diaphragm and the case, also the bolting of the frame of iron to the meter. These are all the differences I can see between the iron and the tin meter. I believe that the matter of the iron meter will be more interesting to us as we go along. The tendency of gas distributors is to carry increased pressure in the mains, so it will be safer for us to provide a stronger measurer than the tin meter; and it will be well indeed for us to take that into consideration.

PRESIDENT MCKENZIE: Mr. Sears has had a good deal of experience in different localities with one meter and another, and I would like to hear from him.

MR. C. W. SEARS: It looks to me a mistake to decorate a front yard with any kind of a meter. Even if you box a meter it is liable to suffer more from dampness and all kinds of accidents (to the dampness trouble especially in this Southern country) and the sun is pretty hot at times of the year. I think it is a great detriment to any meter to set it out of doors. I don't think it is right to allow it to be placed that way, and I don't think a consumer would be justified in demanding it. The proper place for a meter is either in the house or in the cellar under the house.

MR. F. L. STUCHELL: I have had lots of trouble with iron meters set on the outside in the winter in the snow. The sun would shine on the dial of the meter causing the moisture to run down and collect on the regular dial and as night came on

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that moisture would freeze. Of course, in the morning with the sun out it would thaw again. The ice would collect in the dial and freeze, preventing the free action of the meter. Sometimes the glass in the dial would break from the effects of the freezing. Probably it went on for we didn't know how long without the meter registering. I would like to know if anybody else had that trouble, and certainly at Wellington, Kas., we had lots of trouble from it.

MR. C. W. SEARS: On meters standing outside I had trouble from ordinary moisture getting in the inlet, thus shutting off the gas from that point. It would not have been caused if it had been set anywhere it was protected from the weather.

MR. J. S. CONNOLLY: At Carthage, about three years ago, we had trouble of that kind, but since that time they have given very general satisfaction. We are entirely satisfied with them.

PRESIDENT MCKENZIE: With the meters on the outside?

MR. J. S. CONNOLLY: Inside and outside, both.

MR. J. F. OWENS: I have never seen a meter of any sort that was set outside that it would not give some trouble. Such has been my experience. I don't believe it is a good plan to set a meter outside, under any conditions, if you can possibly get away from it.

MR. W. H. HAMMON: I enjoyed very much the paper that Mr. Holmes read, and am pleased to see he is converted from the tin meter to the iron meter. I know he tried to write a good paper in a purely impersonal spirit, and I thank him for the way he handled it. The reasons that he gives for preferring the iron meter to the tin meter are true in every particular, according to the experience we have had. I would only say further that Mr. Sprague, inventor of the Sprague meter, is here and perhaps he might say something also.

MR. H. H. SPRAGUE: I would like to say, in the first place, that I am not an addressor of audiences, and my position in connection with this subject of iron meters precludes me from saying very much about it. I would say, however, that a good tin meter is a great deal better than a bad iron one, and that if you can get a good mechanism in an iron case it is a great deal better than a tin meter, and to get the full light on the subject

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the Association might — perhaps not in a convention, but among themselves — discuss the details of the mechanism as contained in the iron meter under discussion. Another point I would like to make is, that when a man has trouble of any kind with a meter he is likely to declare that that meter is no good, but he should put it up to the maker and the inventor, and sometimes it is very simple, like this matter of the congestion from the oil. If they could ask me or show me what was the matter, and would put it up to me to save it, I would say that I could do it very easily. All you have got to do is to tell me what is the trouble and I would guarantee to fix it. (Applause).

Thereupon, after some minor discussion by Messrs. Davis, McIlhenny, Owens and others, it was regularly moved and seconded that a vote of thanks be tendered to Mr. Holmes for his paper, which motion was unanimously carried by a rising vote. On motion, the convention adjourned, to meet at 9 o'clock, the morning of May 19.

Session of Thursday, May 19th.

The Association met at 10 o'clock A. M., Thursday, May 19, 1910. After calling the meeting to order President McKenzie introduced Mr. H. R. Davis, who was greeted with applause and then proceeded to read the following paper:

SOME REMARKS ON GAS COMPRESSION.

H. R. DAVIS.

On the average natural gas consumer the mention of gas compression has a peculiarly irritating effect. He has heard that the large compressing stations of the natural gas companies are maintained for the purpose of pumping air into the pipe lines, and whenever his gas bill exceeds his own modest estimate of what it should be he proclaims his belief. This rumor started when the first compressor station went into operation, and the truth has been trying to overtake it ever since with small hope of success.

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The man in the natural gas business, not directly concerned with the transportation, knows that compression helps, in some way, to forward the gas from field to market. How, or why, he seldom stops to inquire.

The natural gas engineer recognizes in gas compression the solution of many of his difficulties. Incidentally, compression introduces problems of its own, not all of which have been fully solved. Without compression, most, if not all, of the great natural gas enterprises would be impossible. Properly applied, compression increases the capacity of pipe lines many times, and makes practical enterprises which otherwise would require an investment so large as to be prohibitive.

Before going further it may be well to explain just what is meant by compression. The atmosphere exerts a pressure varying with the altitude and averaging at sea level 14.72 pounds per square inch. For such rough calculations as may be needed here for illustration 15 pounds per square inch will be considered as one atmosphere. This pressure of the atmosphere must be borne in mind. Men often forget it in discussing gas pressure. Even experienced engineers sometimes expose themselves to ridicule by neglecting it in their calculations.

Natural gas, like air or any other gas, occupies a space inversely proportional to the pressure upon it. That is, if we have ten cubic feet of gas at atmospheric pressure, under two atmospheres or 15 pounds gauge pressure, the same gas will occupy only five cubic feet. Under ten atmospheres or 135 pounds gauge pressure, the space occupied by the gas will be reduced one-tenth of the original volume. In the above illustration we are assuming the temperature of the gas to remain constant.

Since, then, putting the gas under pressure so greatly reduces its volume, it is clear that the higher the pressure at which we carry the gas the greater the volume which a pipe line will contain. That raising the pressure will increase the capacity of the line to convey gas may not be so apparent at first glance. It is a fact, however, that the capacity of a gas pipe line increases with the initial pressure and at a faster rate.

Natural gas compressing stations may be divided into three general classes, according to the nature of their work.

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As an example of the first class, we will suppose a field which has been supplying gas to a market one hundred miles distant through a 16 inch line. Originally, this field had a rock pressure sufficient to maintain an initial pressure of three hundred pounds on the line. Assuming that a terminal pressure of 50 pounds must be maintained and using the usual formula for calculating the flow of gas, the line under consideration is capable of delivering about 35 million cubic feet of gas per day.

If the pressure of the field falls until it can maintain an initial pressure of only 200 pounds, the capacity of the line is reduced to 23 million cubic feet per day. In order to get the original capacity with the reduced pressure, it will be necessary to duplicate the original line for about three-fourths of its length, or seventy-five miles. There is the further certainty that even this will shortly be inadequate.

Now let us see how compression will help us. A compressing station with power to compress to 300 pounds from any intake pressure, and with capacity, so long as the intake remains above 100 pounds, to handle all the gas the line can carry can be installed for about 15 per cent. of the cost of a new line. This figure is only approximate and varies with every case. The greater the distance from field to market, the greater is the advantage of compression as compared with installing an additional line. The proper balancing of the sizes of compressor station and line, so as to obtain maximum capacity with minimum cost, is one of the most important problems which the natural gas engineer is called upon to solve.

The second application of gas compression is found in relay or intermediate stations. Considering again our problem of the 16 inch line 100 miles long, we will assume that the consumption of gas increases beyond the line's capacity of 35 million feet per day. The problem now is — Shall we duplicate part of the line or install a compressor station about midway between the terminals.

It is evident to all that other conditions remaining the same, a short pipe line will deliver more gas than a long one. Placing a compressor station near the middle of our pipe line has the effect of making it necessary for the field station to deliver gas

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to a point only 50 miles away. Here the new station will pick it up and forward it the remaining distance. This practical reducing the length of the line by half adds to its capacity about 35 per cent.

The ratio between the costs of the compressing station and the pipe line necessary to give an equal increase in capacity is less in this instance than in that first considered, but the balance is still strongly in favor of compression. Beyond this point the ratio diminishes rapidly, and with the pressures now used on most trunk lines, it is not economical to place compressing stations much nearer to each other than 50 miles.

The maximum pressure which the system is designed to carry determines the economical distance between stations. The present trend seems to be in the direction of continually increasing pressures. The high pressures make possible the use of smaller pipes and reduce the number of compressing stations necessary on long lines.

The third application of gas compression might perhaps be included in the first class considered. It is the use of small compressing stations to render available isolated gas pools of low pressure at some distance from the main line. Were the gas from such a field allowed to flow to the main line compressors with only the field pressure behind it, the low intake pressure would effect a reduction in the capacity of each compressor, and the number of compressors required would be correspondingly increased. A small compressing station at the field will usually show a marked economy as compared with the large main line compressors and enlarged field pipe lines which must otherwise be used. Besides this, these local compressing stations increase the output of a field, so greatly as often to pay for their erection inside of a year by this increase alone.

The distinctive feature of the compression of gas is the variable intake. In air compression the intake pressure is almost always the pressure of the atmosphere, which is practically constant. In handling natural gas, any one of a hundred causes may affect the flow of gas in such a way as to make the intake pressure vary within wide limits. The capacity of any compressor, or the number of cubic feet pumped by it per minute,

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is directly proportional to the intake. That is, a compressor which will deliver 1000 cubic feet of gas per minute with an intake of one atmosphere will deliver 2000 cubic feet per minute with an intake of two atmospheres and so on. It is evident then that as the pressure of any field declines, the capacity of the station supplied by this field must be correspondingly increased to maintain a uniform delivery to the line.

The power required to drive a gas compressor also varies with the intake, the discharge pressure being constant. However, the relation is not so simple as the one given above. It is evident that if the intake and discharge pressures are the same no power will be exerted. Also, if there is an absolute vacuum at the intake, there will be no compression and consequently no power required. Then the power must increase for a time as the intake pressure rises, reach a maximum, and then grow less for any increase of the intake. Theoretically, this maximum point is reached when the intake pressure is .325 of the discharge. In practice, the maximum power is usually required with a rather higher intake than that obtained by calculation.

The principles which I have outlined above are now taken for granted by all natural gas engineers. In the laying out of a new natural gas system every movement of the gas from well to consumer is a matter of exact calculation. The sizes of the pipes and the capacities and spacing of the compressor stations are all proportional to the work they will be called upon to perform. Being able, thus, to proceed with absolute assurance, we are liable to forget how recent are the beginnings of our art, and what a bold innovation it was but a very few years ago.

In 1890, Pittsburg had been using natural gas for a number of years, and the field pressures were falling rapidly. Many and various were the plans brought forward to increase the supply of gas to the city. One man, still known to the engineering profession, advised that large steel tanks should be taken to the gas fields, filled with gas at well pressure, hauled by rail to the city and connected to the pipe lines, where they could give off the pressure they had obtained at the wells.

Other engineers, among them George Westinghouse, saw no way out of the dilemma, except by increasing the capacity of

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the pipe lines, and thus was the plan pursued by the Philadelphia Company.

Mr. J. N. Pew, then President of the People's Natural Gas Company, conceived the idea of handling natural gas by means of pumps. To him, undoubtedly, is due the credit for introducing compressing stations into the natural gas business. His success was not achieved without overcoming opposition and discouragement. Several of the prominent pneumatic engineers considered the plan of very doubtful practicability. Others declared it absolutely impossible. About this time Mr. Pew met Mr. Greenwood and Mr. Gerdes of the Hall Steam Pump Company, and it was from these gentlemen that he received his first encouragement. They believed his scheme to be practical, and so advised him. To settle the question without undue expense, they suggested that a small experimental plant be built. This appealed to Mr. Pew and experiments were at once begun to determine whether natural gas could be successfully handled by means of compressors.

A 10" x 12" oil field engine of the Mogul type was purchased, the back head removed, and a gas cylinder 6 inches in diameter by 12 inch stroke was attached to the engine. This machine was installed at Wilkinsburg, and there a small pipe system was designed and built and experiments carried on for a month or so. The result was a complete justification of the theories of the builders.

Mr. Pew immediately placed an order with the Hall Company for the first commercial gas compressing station. This was located in the Murraysville field and delivered gas to Pittsburg. It consisted of a duplex 24" x 30" Stearn's slide valve engine, attached to the rear of which were two Hall 20" x 30" gas compressor cylinders.

After less than a year's operation, orders were placed by the same company for two more machines for the same field. At the very outset, Mr. Pew fully grasped the essential principles of pumping gas, and immediately obtained a patent on a system, which included a large receptacle placed near the compressing station and attached to the pipes coming from the field, thus gaining a large volume of gas at the compressor and insur-

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ing a uniform flow in the pipe line. He was unable, however, to secure a patent of such a scope, as to prevent his plan being followed by others.

Indeed, the success attending Mr. Pew's efforts was soon appreciated by his competitors, and a number of stations similar to his were installed in the different fields.

The Philadelphia Company installed near Cannonsburg two cross compound engines of the Porter Allen valve type. As an effort toward the economical production of power their move was commendable. Unfortunately, they had little conception of the gas compressing problem. They decided that a gas compressor could be built exactly like a blowing engine, and, accordingly, built the machine with mechanically operated sliding inlet valves. Furthermore, the gas cylinders were built for compound compression. As designed, these engines were a failure. Later the gas cylinders were replaced by Hall single stage poppet valve compressors, and for the past ten years they have been in successful operation.

This brings us up to the year 1900, in which year the Carnegie Gas Company, in Pennsylvania, and the Fort Wayne Gas Company, in Indiana, installed stations aggregating in each case about 3,000 horse power. These stations were built along the lines of modern steam engine practice, with cross compound condensing Corliss engines, water tube boilers, and all the auxiliaries necessary for the economical use of fuel and steam. It is worthy of note that these stations were a remarkable step forward in the practice of gas compression. The compressors used on these engines was practically the equal of the best gas compressor in use today. Modifications of the design used here have, of course, been made, but they have been to meet different conditions, and do not constitute material improvements.

Since 1900, all the large natural gas companies have been forced to the use of compressing stations. Up to 1904 or 1905 most of the stations were driven by steam engines. However, prior to that time there were a few natural gas managers, more courageous than the rest, who turned to the gas engine as the power best suited to the work. The first successful direct connected gas engine driven compressor was built in 1899 by the

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National Transit Company, of Oil City, Pa., from the designs of their engineer, Mr. Klein. Two cranks were placed at opposite ends of the same shaft and set at an angle of 90 degrees to each other. One of these cranks was driven by four single acting power cylinders. From the other crank were driven four compressor cylinders. The 90 degree angle between the cranks allowed the maximum point of power stroke and maximum of compression to come nearer together. Eight or ten of these engines were built later by the Snow Steam Pump Works and most of them are in successful operation today.

The first gas engine driven compressor of the present type, having the compressing cylinders opposed to the power cylinders, was built about 1902 or 1903 for the Logan Natural Gas & Fuel Company and installed at Sugar Grove, Ohio. It was a 400 horse power engine with 36 inch stroke. It gave fair satisfaction in spite of some faults in the design. These faults were afterwards corrected and the machine is giving excellent service today. Shortly following this first engine the Snow Company undertook the construction of two 4500 horse power engines for the Hope Natural Gas Company, and installed them at Hastings, West Va.

This brings us to the present standard twin tandem double acting gas engine gas compressor of about 1,100 horse power, so many of which have been installed in Ohio, Indiana, West Virginia and Kansas. This engine has been perfected to a degree which gives little prospect of any material improvement or change in design. When working at its maximum load of three compressions, it uses for fuel about 2 per cent. of the gas pumped, an economy which cannot be approached by any other power. In point of reliability, it shows itself equal to any demand put upon it for hard and continuous service.

The use of gas compression appears to be far from having reached its full development. The falling pressure in the older fields is continually causing the building of new compressing plants, and there is little doubt the near future will witness large gas compressor installations for the exploitation of fields hitherto unutilized.

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DISCUSSION.

MR. W. M. WELCH: The subject is one that it is almost impossible to determine where to begin to ask questions. Mr. Davis has touched on a few high spots connected with the business. There is a book written on this subject today, and five years from now probably another book nearly as large will be written on the same subject with new information. The industry of building gas compressing stations is developing. We are learning something new about it every day, and are intensely interested in it. One point that Mr. Davis referred to in connection with the business of transmission pipe lines and compressing stations is the difficulty of securing proper pipe lines and stations. It is a very intricate problem. So many conditions enter into it that anyone contemplating a long transmission system, and thinks he hasn't very much of a job on his hands, will find out before getting through that there is something to it.

MR. W. H. HAMMON: I am indeed pleased to hear a paper on a subject in which I have been very much interested ever since I first got into the natural gas business, and I think no more interesting problem is connected with the natural gas than is this one of compression. Shortly after my connection with the gas companies I saw some of the advantages that might come from natural gas compression, and began remodeling some old plants and improving their efficiency. Up to that time not much had been done that was of particular value. Just a few stations were pumping gas, and the first time I saw Mr. Pugh's station, in order to have any gas for his customers, he was hauling coal to the compressing station to run the compressors in order that he might have some gas left to pump. In one of the real experiences that came to my attention, a station that was pumping gas had some 15 inches vacuum, and every time the station started no improvement could be realized in town, and at the same time I had my doubts of any improvement, permanently; but we set the meter some miles ahead on the line and found that, when the station had been still for 12 or 14 hours, we had more gas passing through the meter than we had when it was running. The engines were consuming considerably more than the increased output of the

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wells. But that was just at the time when changes were beginning to be seen. When Carnegie's first large station was put in the advantages of it were shown almost immediately. One amusing incident came to my attention at that time. A competing company had gone into Green county, and nearly all of the companies were drilling their wells back from the boundaries to protect each other's property and stood back three or four hundred feet, but a new company came into the field and didn't see the necessity of following the same plan as the rest of us. Ten Mile Creek was the boundary. But the foreman set their drill directly on one shore, and an officer of the Carnegie Company suggested that everybody must get back to the boundary, and would he not follow the same rule. No, he knew how to handle his own business. And so while he was drilling, the Carnegie people also drilled on the opposite shore, immediately opposite. We had a foreman in the district who was fairly well acquainted with gas matters. A few months later the foreman of this competing company came to our foreman and told him that there was something the matter with the line—he didn't know just what it was; they had a well that acted very peculiarly, and wanted to know if he could go down and explain matters. So he went down and they put a gauge on the well and thought that would determine how much the well was producing. The line pressure was something like three or four hundred pounds, and they put the gauge on the well and shut in the well by shutting the gauge on the line and immediately the gauge on the well began to go down instead of up. The opposing company had a compressing station there so close that it was drawing something like 35 pounds and they had a pressure of 250 pounds at the well to overcome, and so the pressure of gas was going down the well and out on the other side of the creek. So it is not for commercial purposes that gas compressing stations are always built, but they really perform the benefit. Shortly after that we built a station in West Virginia that I believe has paid for itself three or four times over in the saving of drilling alone, but the ability to lower the pressure at the well, and I have never known a real thoroughly, properly installed pumping station that hasn't paid for itself by the same token. Most people have been inclined

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to wait until they had to build a compressing station before they built. While they will surely, as a rule, have to build it some time, if they only build it in the early stages they can save their bill many times at the compressing station by conserving the gas and still have it for delivery when they need it or when they will be compelled to have it later. The conditions of when it comes to getting the gas and when it comes to taking it to market from long distances, are where it is absolutely indispensable. I believe it is a fact that in a long distance piping system that was built five years ago or more the plant could be duplicated today by the use of compressing stations, at approximately one-half to two-thirds of the original cost. I have been doing some work on the compressing which would be absolutely impossible five years ago — couldn't have been done five years ago — nobody knew enough to do it, at least — and where the relaying stations don't consume more than one per cent. of the gas that goes through them. (Applause).

SECRETARY JONES: I move a very hearty vote of thanks be extended to Mr. Davis for his interesting and valuable paper.

The motion was severally seconded and put and, by a rising vote, unanimously carried.

Thereupon, at the suggestion of the President, Mr. W. M. Welch was called upon to read the paper prepared by Mr. M. G. Reynolds on "Care and Installation of Regulators," which he did, as follows:

CARE AND INSTALLATION OF REGULATORS.

M. G. REYNOLDS.

As this paper has been assigned to me I will endeavor to give it what thought my limited time will permit and trust by giving you some of my observations and experiences as a manufacturer of Regulators it will assist in improving the service given.

To secure good regulation the Regulators should have the best conditions possible, as the best machine cannot do good work if any water, obstructions, and especially if any hard particles

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collect in the valve and seat. In laying mains each joint should be cleaned separately and before connection is made to the Regulator the line should be blown out to clear it of loose scales and hard particles. During the first year's service of screwed pipe, scales will become detached and are carried along with the gas. If a screen is used at the inlet and the gas is not clean these scales soon clog and prevent a free flow, but if a large cylinder is installed ahead of the Regulator and the current slowed up these particles drop and will not get into the Regulator. We have known of such carelessness in laying pipes as to find a piece of a fence rail left in the pipe, another where a squirrel had made its nest and store-house in the pipe before it was layed, and which consisted of a half-bushel of leaves and twenty nuts, and these were found in a Regulator that was reported as not doing its work satisfactorily. These, of course, are extreme cases, but we have so often found that where the Regulator failed to properly regulate, and especially on the minimum supply, that it was almost invariably caused by some hard substance finding its way to the valve and stopping between the valve and the valve-seat. If it is a scale of iron and the valve closes on it, the tight closing valve is destroyed and the pressure creeps up on the minimum consumption and of course the pressure increases until the safety valve blows and prevents further raise of pressure and causes much waste of gas. If a Regulator of a proper size could always be installed to supply the peak load with the valve well open, it would allow all of the small particles to pass through and out of the way. It is the large volume flowing through the pipes that moves the scales and dirt, so if the Regulator is of large capacity and the valve is only slightly opened it is much more liable to stop the scale in the valve and cause bad regulation. So we think it best to consider well the size of piping, the pressure to be reduced and the size of the low pressure main to be supplied at the reduced pressure, then install a Regulator large enough to deliver the volume easily. The pressure on the high side has much to do with the installation as the volume contained in a given space is about doubled in raising the pressure from four ounces to fifteen pounds. The valve capacity of a Regulator should be equal to the area of the

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line so that should the pressure drop to near the discharge pressure the Regulator will not retard the passage of gas when the high pressure is at its minimum. If a uniform pressure could be maintained in the high pressure line of say twenty pounds a Regulator could easily supply a much larger low pressure main. With the latest improvements we have known of a 12 inch low pressure main being supplied by a 4 inch Regulator. This could not be accomplished with the pressure the same on both sides of the Regulator — it must have the differential in pressures. If there is a question of supply to a certain point, as there always is where gas is transported through long pipe lines, we do not think it advisable to install mains and Regulators of a much larger capacity than are needed to handle the maximum volume that can be delivered at that point, as further expense is a waste of funds and may not give as good results when the higher pressure is maintained. In the installation of reducing stations on a pipe line it is advisable to install the Regulators in duplicate so that in case of any repairs or cleaning is needed, the opposite Regulator can take care of the supply. But if a single Regulator is used, then a by-pass around the Regulator should be installed to be used in case the Regulator needs repairing and in this condition, with a gauge on the low side, the by-pass valve can be gradually opened until it supplies the volume required which will be indicated by a slight raise in the pressure and closing of the Regulator. Then the valve at the inlet of the Regulator must be closed tight, after which close the outlet valve, then the Regulator can receive the needed attention, and while the Regulator is being repaired observe the gauge and manipulate the by-pass valve to suit the pressure needed. When the work is completed always open the low pressure valve first, then the high pressure valve, which puts the Regulator in action; next gradually close the by-pass valve. When installing Low Pressure Regulators at different points through a city plant we do not think it necessary to use a by-pass at all, but would connect the Regulator between the high and low pressure mains, using a gate valve on both sides of the Regulator so that if necessary it can be cut out of commission and the necessary volume will come from other stations for the short time the Regulator is out.

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With clean dry gas the Regulator seldom requires any attention but it is advisable to visit them occasionally. The office gauge will quickly indicate an error if anything goes wrong at the station. The first Regulator that was installed at Iola, Kansas, was set within a few feet of the well. Three years later I called on the gas company and with their superintendent went out to see this Regulator. He informed me he had not given the Regulator any attention whatever during the three years, excepting to shift the weight to change from Summer to Winter pressure. Being anxious to see its condition inside we took the Regulator apart and found the valve and diaphragm in perfect condition. This Regulator was reducing their well pressure direct to low pressure of eight and sixteen ounces. We think it advisable to examine all Stations twice each year, in Spring and in Fall, and if they do not close tight or the diaphragm shows the slightest leakage, take them apart and thoroughly clean the inside, especially the valve and valve-seat. When these are cleaned, put the valve back in place and turn it around several times while it is in contact with the seat, then remove the valve and you will readily note where they have come together. It will show a bright line where the two metals have come in contact; if it does not show a complete contact on both parts re-grinding is necessary. Flower of emery or pumice stone and oil may be used for grinding these metal valves, using a little grinder where the metal shows a contact. Put the valve in place, give it a few turns, remove and clean it off and note the results. Continue grinding the high places until the valve fits perfectly, this properly done the Regulator should do as good work as when new. If the Regulator has a stuffing box and gland, this packing will need some attention as it is very liable to harden and require a very tight gland, which would cause much friction and a greater variation in the low pressure mains.

A diaphragm made of a good grade of rubber should last for several years if the Regulator is kept in proper working order, but must be renewed if damaged.

Regulators intended for Natural Gas were all constructed so that they received the controlling power from the low pressure mains which has given very good satisfaction, but with the

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advent of high pressure artificial gas, which is now being pumped as high as forty and fifty pounds, it was necessary to improve on Regulators so as to hold the required inches in the water column, a variation of not more than two-tenths was required and secured. This was accomplished by using the low pressure and to this was added a part of the high pressure through an auxiliary system, which made it possible to secure any amount of power that was necessary to hold a perfectly steady pressure in the street mains regardless of the volume needed. The improvements made in the various sizes and makes of Regulators in the past few years has revolutionized the distribution of both natural and artificial gases throughout the entire world.

Having concluded reading the paper, Mr. Welch added: Not being the author of this paper, I will say it really ought to be discussed, for the subject of gas regulation is one that is very important. A great many phases of the question are really slighted by both the man who uses the regulator and the man who ought to use it or doesn't use it but uses the gas. We ought to know more about it. However, that will develop.

DISCUSSION.

PRESIDENT MCKENZIE: You have heard that interesting paper read by Mr. Welch. The writer is not with us. I think this is a subject of vast importance to all natural gas men, or men who are distributing gas under pressure. I would like to have some discussion on the subject.

MR. W. M. WELCH: If there are any questions, I will endeavor to answer them. I would not wish to speak for Mr. Reynolds, however.

PRESIDENT MCKENZIE: We ought to go into this subject pretty thoroughly.

MR. L. K. WHITEHEAD: I would like to ask for information as to the danger or proportion of danger ahead of the regulator.

MR. W. M. WELCH: I don't know particularly what proportions he may have in mind, but as the idea presents itself to me it simply means that dirt in the gas or in the pipe is drawn up

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to the regulator and clogs it with solid matter. It very often occurs that the screen becomes clogged up and the flow is cut off before it reaches the regulator. By figuring a little bit on the size of this receiver, I believe a large part of the regulator difficulty probably would be overcome. You may say that the size of the receiver might be three or four times the diameter of the pipe, possibly six times, depending upon the pressure. If you have very high pressure, of course, you will increase the size of your receiver; but that is a matter that can be worked out.

MR. F. W. STONE: Mr. Whitehead asked about the devices for taking the dirt out of the line. Two methods are designated in the Wrinkle Department, one of which is found on page 137; and, by the way, the cut is upside down. I don't know how it happened, unless it is that Delaware is a dry town and Columbus is wet and this is the last thing our Secretary had to do before he went home. (Laughter.) In this case I read this wrinkle right now, and cut out that portion of it when it comes to talking about the "Wrinkle Department." Another scheme is shown by cut on page 130, and both these schemes are very good ones. The one on page 137 was tried first, and the amount of dirt coming through the line was so great that it was found impracticable to use it, and it wouldn't take it all out, hence the receptacle filled up so fast it couldn't be kept clear. This other scheme (cut No. 5, page 130) was adopted afterwards.

MR. J. M. GARARD: While talking about the regulation of gas I would like to ask the members in general if they have had an experience of this kind and whether they tried to overcome it in like manner. We have in our system some high pressure lines; for instance, a line of 142 miles, 18-inch line, from Knox county, O., to Cincinnati. From that we have various lines, and the line running down South goes to some of our smaller towns. We have had a great deal of trouble on the 3, 4, and 6-inch lines from the regulators freezing up. Some of those are located just where we cannot well have a furnace, and I give all this credit to one of our employees, our foreman, who suggested the putting in of a third regulator. We carry probably 150 to 200 pounds on this 18-inch line, and the same would be on the other. The foreman suggested putting in a third regulator, re-

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ducing from 150 pounds to 50 or 75 or whatever the case might be. There were two regulators and we put in the third, and never had a particle of trouble since — never have had a freeze-up on those lines. There is not enough gray matter here (tapping his head) that could tell you how, but if anybody can tell I would like to know how it was, or whether it just happened so.

PRESIDENT MCKENZIE: Have you had any cold weather since?

MR. J. M. GARARD: Yes; same conditions in the atmosphere. The freezing took place some time before the holidays. After that time we had some extremely cold weather, but never had a particle of trouble with any of them. They have gone right along doing their work perfectly. If you don't know it and if anybody can tell me I would like to know.

MR. W. M. WELCH: I think Mr. Garard is trying to get up a little discussion here by wanting somebody else to tell what the trouble was and how he overcame it. In that connection, where we have a regulator reducing from various pressures, from possibly 225 pounds at one time to 75 pounds at another, we frequently have to visit the regulator station. The regulators are located on the edges of the towns, as Mr. Garard's probably are, and we would have to visit them to open up the regulator on account of its freezing, although I am not going into a discussion of the cause. I think the idea suggested by Mr. Garard excellent. It might seem at first there would be objection to having three regulators to reduce from high to low pressure; but I believe it is a step in the right direction.

MR. W. H. HAMMON: Do I understand from Mr. Garard there were three stages in his elevation from high pressure to low? It is very simple what would cause the liability to freeze.

MR. J. M. GARARD: Tell me.

MR. W. H. HAMMON: My reason is this: The amount of heat absorbed, which causes the freezing, depends on the amount of expansion in one locality. The expansion of the gas from a high pressure to a low must absorb an enormous amount of heat, and if the expansion was less in any one locality the absorption of heat will be less and a lower tendency to freeze. By distributing the expansion through three separate stages he

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reduces his chances of freezing to one-third what he would if he had but one.

MR. F. W. STONE: Do I understand, from the latter part of Mr. Reynold's paper, that there is a regulator (that is practical) that increases the pressure on the low pressure side automatically as the demand increases, and that it drops it again when the demand decreases? What I am getting at is this: Suppose we are running six ounces on the low pressure side and we have an unusual demand, do I understand that there is a regulator made which will automatically put nine ounces on the low pressure side of it?

MR. C. W. SEARS: I understand there is not an appliance of that sort now, but Mr. J. S. Connolly is working on that theory. Perhaps he can tell us something.

MR. J. S. CONNOLLY: I would like to ask the members if any of them had a similar experience to mine. We had two installations — two 8 by 10 regulators — reducing the line pressure from 175 pounds to 200 pounds, down to 25 pounds, serving a belt line. Those regulators were very carefully attended to at least once a month. They ran perfectly for a year, as perfectly as a regulator could, keeping the pressure to 25 pounds at all times. A morning in November one of them started jumping; that is, it would feed up on the belt line, increasing the pressure from 25 to 40 pounds, then it would suddenly close off, remaining so until that belt line reduced its pressure to about 15 pounds, when it would open with a shock. We then cut in the other regulator, which had been working perfectly for a year. It soon acted like the other one — the only time the second regulator had been in use at all was when we were cleaning the first one. Well, we took the first regulator to pieces and examined it thoroughly to determine if the valves were worn to any extent whatever. We found no wear on the valves, yet we never could get it to work perfectly at 25 pounds pressure. We wrote the factory and a man came from the oil fields. He was an old regulator man, like Mr. Connolly, but he couldn't help me. I wrote the factory again, and they asserted my diaphragm was too small — 9½ inches diameter. They sent me two new ones, 14 inches in diameter, and I put them on and

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haven't had any trouble since. The question I want to have answered is, why did this regulator work perfectly for a year and then go to jumping, and in a prohibition town, too? (Laughter).

MR. C. V. LADOW: We have had similar trouble, more or less, with regulators used on our wells, especially so last winter. Our field is only four miles from town, so we had to get the pressure down on each well. One especially big well that we didn't use got to throwing out shale every few days, to the extent that we were unable to take care of it. Our main man on going there said he could tell what the trouble was. A very small hole lets the gas pass from the main line around to the top of the regulator, and our difficulty was that this hole in the pipe leading around to the top of the diaphragm had become clogged with dirt, so the minute it stopped that pressure off the top of the diaphragm the wind passed through the regulator or opening, and we put an extension pressure on top of the diaphragm. We had that same thing again where two regulators were close together, but overcame it by placing the regulators farther apart. Where we couldn't put them farther apart we placed the standpipe or iron pipe sideways, which overcame considerable of that jumping.

MR. K. M. MITCHELL: This is a great subject, and no doubt we could talk about it all morning, but I understand we have quite a good deal of business before us, so I move, sir, we extend a vote of thanks to Mr. Reynolds for this excellent paper. (Seconded, put and adopted).

PRESIDENT MCKENZIE: As Mr. J. C. McDowell (you will remember the message from him, read yesterday) is unable to be with us, Mr. G. W. Barnes has kindly consented to read his paper.

MR. G. W. BARNES: As a preliminary to reading this paper, I would remark it deals with one of the most important subjects which the Association can take up. I am not sure that any of us realizes how much this means to the gas fraternity. We, as representatives of the capital invested in it, and more particularly our principles or the men who furnish the capital, are vitally concerned. It should receive the marked atten-

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tion of every member, not only as an interesting paper, but with regard to future action upon the subject in hand. I hope you will take this under consideration, in hearing the paper read as well as after it has been read.

Mr. Barnes then read the paper by Mr. J. C. McDowell, on

THE CONSERVATION OF NATURAL GAS.

J. C. McDOWELL.

Conservation of our natural resources is a subject of national interest, and general discussion at the present time. The importance of this subject to the gas industry is very great, for no other one of the Earth's treasures has been so wantonly wasted as natural gas. The elusive nature of this product necessitates unusual care to prevent waste, but I speak particularly of the careless, willful, preventable waste that has been going on with accelerated pace for more than a generation. Its magnitude is appalling, and it is both fitting and timely that this Association take advantage of the present general interest in conservation and if possible, reduce theoretical to practical conservation, by crystallizing public sentiment into laws that will effectually prevent all unnecessary waste of natural gas.

Deposits of natural gas are more generally or widely distributed than any other mineral product of the United States. It is found in nearly every rock porous enough to contain it. It is closely associated with petroleum, and the production of oil is nearly, if not always, accompanied by the production of gas in some quantity, from the same well, at the same time. However, gas deposits cover a much greater area than oil deposits, extensive areas of gas bearing strata are developed in which no petroleum is found.

While natural gas is so universally existent in the earth, its profitable commercial exploitation requires that it be found in a rock stratum entirely encased within an impervious stratum of shale and that it is not accompanied by oil in paying quantities, or salt water in great volume.

Up to this time five great regions have been discovered and developed within the United States and Canada. The principal

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deposit in each of these regions is found in a different geological period from the others. In the order of their discovery and utilization, they are as follows:

THE APPALACHIAN REGION.

Extending from the southern counties of Western New York, along the west flank of the Appalachian Mountain System, through Pennsylvania, Southeastern Ohio, West Virginia into Kentucky. Within this region the deposits are found principally in the rocks of the Devonian Period, and in many different strata varying in depth from a few hundred feet to three thousand six hundred feet, and there is little doubt of deposits in still lower strata. Until very recently it was thought that the limit of profitable production had been reached in these deep wells, but a recently invented drilling bit by the rotary method will, in the opinion of the writer, make it possible to drill to a depth of five or six thousand feet. Only those who have closely watched field developments can fully appreciate the importance of this invention to our industry.

THE TRENTON ROCK REGION.

Extends from the North Shore of Lake Erie in the Province of Ontario, Canada, in a southwesterly direction through Northwestern Ohio and the State of Indiana. The gas deposit of this region was confined to one formation — The Trenton Rock of the Lower Silurian Period — geologically the oldest deposit yet discovered. There was but one producing stratum in this region, it being near the top of the rock. The existence of oil and large quantities of salt water in the same rock with the gas was a very unfavorable feature of this deposit, tending to shorten the life of the field, which on account of the depth of the wells, had a low initial rock pressure.

THE CLINTON ROCK REGION.

Extending from the Province of Ontario, Canada, on the North Shore of Lake Erie, through Central Ohio, to the southern counties of that State. The deposit of this region is found

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principally in the Clinton Formation of the Upper Silurian Age, at a depth of from one thousand to three thousand feet; geologically it lies between The Trenton Rock of the Trenton Region and the Devonian of the Appalachian Region. No oil in profitable quantities and no salt water of sufficient volume to interfere with the production of gas has been found in this formation.

THE MID-CONTINENT REGION.

Extends from near Kansas City in a southerly direction, through Kansas and well toward the southern counties of Oklahoma. The deposit throughout this region is found in irregular sand formations of the Carboniferous Period, at a depth of from four hundred to two thousand feet. Many of the developed sands produce petroleum in very large quantities and gas in great volume from the same wells. Other sands of the same region produce gas in very large volume, free from oil, and comparatively free from salt water.

THE CADDO REGION.

This is a comparatively new region, having at present a developed area of about three hundred square miles. Four distinct sands, in the Tertiary Formation, each of unusual thickness, have ben penetrated by the drill at from eight hundred to twenty-three hundred feet in depth, resulting in wells of enormous volume, forty to seventy million feet open flow capacity being not unusual. The field is not yet defined in any direction, and the probabilities are that its present area will be greatly enlarged.

OTHER REGIONS in the United States are in the incipient stages of development. Our nation seems to have had almost a monopoly of this precious fuel treasure—its value probably exceeding all of the vast deposits of coal, of which we love to boast. Stored under great pressure, released by the drill at will, it carries itself to markets far distant from its source, and is supplied to domestic consumers at a cost very much less than any other fuel has ever been, or can be produced by them, and has become a source of great convenience, comfort and increased happiness to millions of our people because of its convenience and cleanliness.

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The zones of natural gas supply have become zones of industrial activity and increased population. The wealth of the State and its revenues derived from taxation on account of such increased population and the various interests fostered and supported by natural gas have been largely increased. States, counties and municipalities, have at great expense equipped state houses, asylums, hospitals, court houses and other public institutions. If the supply is carefully husbanded and protected it will last for a great many years and continue to furnish abundant fuel, and the population, material, wealth and other interests of the state will be benefited and enhanced and the comfort, enjoyment and happiness of the people greatly increased; consequently its conservation is a matter of great concern to the general public as well as to the thousands of stockholders who have invested over three hundred millions of dollars in the industry; and to investors in business enterprises affiliated with and dependent upon the natural gas industry.

The development and operation of every region above mentioned has been and now is a continuous record of reckless and wanton waste. It is difficult to estimate and more difficult to appreciate the enormity of the waste of this cheapest and best fuel known to civilization. Its escape and loss is accompanied with so little demonstration that it attracts but slight attention from the public.

If within the borders of the State of Oklahoma a pile of ten thousand tons of mined coal was being wilfully burned, wasted, every day by its owners, a special session of the Legislature would be called to consider means to prevent the loss, and regardless of existing laws, guarding private ownership, a way would be found to stop it and a court ready to sustain the action. Yet at the present time heat value and money value in volume of natural gas, greater than ten thousand tons of coal is daily escaping into the air and lost, eighty per cent. of which is easily preventable.

The history of every oil pool in Oklahoma is a sickening story of waste of gas, the latest of which is Hamilton Switch or Preston. There is no doubt that the fuel value of natural gas

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wasted in the production of oil in Oklahoma in the past five years has been of vastly more value than all the oil produced.

The same terrible waste has been going on and now exists in the new Caddo District in Louisiana and the people look on, seemingly unmoved. From recent personal inspection and inquiry into conditions in the Caddo Field, I am convinced that not less than four hundred million cubic feet of gas is escaping and wasted daily in that field, having a fuel value of more than twenty thousand tons of coal — practically all of the waste being preventable.

Would the good people of Louisiana stand idly by for several years and see a pile of twenty thousand tons of coal uselessly consumed by fire every day and take no action to prevent it? I think not.

The citizens of West Virginia have for more than ten years been indifferently watching an equivalent of from ten to thirty thousand tons of coal, in natural gas wasted daily, and there seems to be only one man in that State who raises his voice to prevent it, and although Professor I. C. White, State Geologist, has cried aloud and spared not in trying to stop it, his efforts have been unavailing and the pile of COAL continues to burn. This appalling daily dead loss to the general community is unnecessary, and the utter indifference of the public to this awful waste seems inexplicable—unless it is from the fact that what is out of sight is frequently out of mind.

The principal avenues of waste at present are:

First: In drilling for oil in some districts large gas wells are found in sands above the oil sands. In many instances, the pressure and the volume of such wells are so great as to prevent drilling to the lower oil bearing sand until the well has been allowed to exhaust its gas production into the air, sufficient to permit the resumption of drilling. Usually this criminal waste is allowed to continue until the gas bearing sand is nearly, if not quite exhausted.

Second: Many gas producing sands are entirely free from oil, while gas in varying quantities is always found in oil bearing sands. All flowing oil wells are also gas wells of more or less volume: It is not uncommon to find an oil well producing

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fifty to one hundred barrels of oil also producing from five to ten million feet of gas per day, the gas at a low rate, being four or five times the value of the oil.

Third: Leaking gas lines; open Flambeaux; blowing off gas wells.

Fourth: Wasteful methods of utilization.

The oil producer in his insane greed for riches, fortified by the long established custom is the principal transgressor. Having no immediate market for the gas of the upper sands, he allows it to exhaust itself in the air until the pressure is reduced to a point where he can resume drilling; then he penetrates the oil sand where he may and frequently does develop a well producing from five to ten barrels of oil, and from five to ten million cubic feet of gas, the latter having a fuel value at a very low figure per thousand of many times the value of the oil. In nearly every new oil development the oil wells produce gas from the oil sand in considerable quantities. The oil producer, if in need of power uses what gas he requires for power purposes, and turns the balance loose, looking on any surplus gas as a nuisance to be gotten rid of, claiming the right to do as he pleases with his own product, and in the absence of legislation on the subject he seems to be acting within his rights.

Through the third avenue mentioned, the principal waste is from unnecessarily blowing off wells. There are certain districts where the traveler can scarcely get out of the hearing of gas wells being blown off. Most of this is entirely unnecessary and should be prevented.

The loss through wasteful methods of utilization is gradually diminishing, although many millions of cubic feet are wasted daily by flat rate sales without meters and by imperfect devices for burning. It is a matter for serious consideration when from forty to sixty cubic feet of gas per horse power hour is used under a boiler for driving a steam engine, while the same power can be developed by the consumption of from nine to fifteen cubic feet per hour in a gas engine of equal reliability and cost of maintenance.

Under our form of government a National Conservation Law to prevent waste of gas would be of no avail, except on

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United States government land, all of the present production being on lands held by private ownership within the states — they cannot be reached by federal law on this subject, consequently if the waste can be prevented by law, it remains for the state to enact laws for that purpose; and since the oil producer does not seem to appreciate the value of the gas he wastes, he should be restrained by law if possible.

It must be admitted there is a seeming unfairness in preventing a man from operating oil wells on his own farm because he cannot market the gas they produce, while his neighbor on an adjoining farm who has a gas line to a city may continue to operate his oil wells because he has a market for his gas. But, public policy often interferes with so called private rights.

The Trenton Rock Field in Indiana was discovered in eighteen hundred and eighty-six, and that immense field was practically exhausted in twenty years. I think it is conservative to say that three times as much gas was wasted in that region as was profitably used. When in the year of eighteen hundred and ninety-eight the people realized the existing riot of waste was rapidly depleting their valuable reservoir of choice fuel, they effectually prevented any further useless waste of gas in the field by enacting a law declared to be constitutional by the Supreme Court of the United States, in a strong opinion by Justice White, which said to the oil producer: "You cannot produce oil until you provide means to separate and utilize the accompanying gas"; and it also said to the producer and consumer of gas that it was against public policy to waste gas, and prohibited all waste by either party providing severe penalties for violation of the act. Though enacted too late to conserve the Indiana supply, the law was rigidly enforced.

The present laws of Kansas, Oklahoma and Louisiana do not reach the oil producer and in consequence are of little value for conservation. The statute of Indiana for the conservation of oil and natural gas should be enacted into law in every state where oil and gas is produced. It will be opposed by some oil producers and large oil corporations; they will assert that they cannot produce oil and save the gas; that their individual rights are being trampled on, etc., etc. In a recent conversation on

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the subject, the manager of one of the largest oil companies operating in Indiana, said to the writer that he approved of the Indiana law for the prevention of waste of gas; that he had experienced no great difficulty in operating oil wells in Indiana under that law, and that no oil producer ought to object to the passage and enforcement of such a law.

The writer can point to a large number of wells where oil and gas are both being produced from the same well, the gas being separated from the oil and delivered into large mains at high pressure by means of compressors.

It is the duty of every member of this Association to join with the good citizens of the community in which he resides, who cannot be open to the charge of self interest to insist that the Legislature of his State enact efficient laws to prevent the waste of natural gas. Use the press and the platform; agitate the question until its importance is realized and public opinion demands and secures the conservation of Natural Gas.

DISCUSSION.

PRESIDENT MCKENZIE: A most interesting paper is before you for discussion. As it is on a subject that is of vital moment to us all, I hope you will give it the consideration that is importance deserves.

MR. H. R. DAVIS: At the various meetings of our Association we have listened to many interesting papers and have held discussions on important subjects, and there isn't a detail in the papers or the discussions that was not beneficial; but this transcends them all, for if gas supply fails our entire industry drops to the ground. I think the Association ought to put itself on record and advance some practical plan whereby we can effectively use our influence in the direction of preventing the waste of natural gas.

MR. W. H. HAMMON: I regret very much that it was impossible for me to be here yesterday, for I think yesterday one of the prominent men of Oklahoma spoke before you, and stating that there was a strong political pull in the Natural Gas Association of America. Wasn't something of that sort said?

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It was reported to me in some such language as that. I don't know just how it was put, but if there is any political power in the Natural Gas Association of America, with all its consequent ramifications throughout the country, it seems to me here is the place it ought to be applied, most strenuously and forcibly.

Mr. Hammon then related the history of natural gas in this country, recounting many instances of its unjustifiable, not to say criminal, waste; told of the many benefits to be derived from it and the improvements and movements in progress for its future use, and again urged action for its conservation.

MR. W. M. WELCH: There is no question as to the importance of this subject before the natural gas interests. Therefore, if a motion is necessary I make such a motion, that a committee be appointed for the purpose of taking up this subject; that this committee be a vacation committee; and that its purpose be to get in touch with every influence throughout the country, particularly in the natural gas producing States, to make earnest effort to bring about the regulations suggested in this paper. Another thing. This matter is of such vital interest that we have a double source of great regret over Mr. McDowell's inability to be here personally to meet us and discuss the subject. Mr. McDowell's speeches would be more interesting, possibly, than a set paper, because of his vast experience. Now, I move you that a telegram be sent to Mr. McDowell voicing the sentiment of this meeting regarding this matter and expressing our regret at his absence and thanking him for his paper.

MR. M. M. SWEETMAN: I had practically the same thing in mind. I intended to move that the Association officially appoint a committee for the purpose of looking after the conservation of natural gas, that the scope of such committee not be confined to locality, but that the subject be taken up with the different State departments, and with the National government as well, in connection with the agitation for the conservation of natural resources; and that a copy of this paper be sent to the proper officers of the different States where natural gas is produced. (Seconded by Mr. J. P. Strickler).

PRESIDENT MCKENZIE: The prior motion of Mr. Welch is before you.

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MR. W. M. WELCH: As to this committee, I merely presented that as an idea for the Association.

PRESIDENT MCKENZIE: You don't want that to go before the house as a motion?

MR. W. M. WELCH: I don't care whether it takes the shape of a motion or not, but I want some action sooner or later. The motion I made was that a telegram be sent to Mr. McDowell. (Seconded by the Secretary).

The last named motion was put and unanimously carried. Thereupon, after discussion by Messrs. Sweetman, Welch, Garard, Stone, Hammon, Holmes, Mitchell, Barnes, Miller and others, the motion of Mr. Sweetman was amended to read that the President, in vacation, appoint a Conservation Committee, to consist of not less than five members, and that the expenses of such committee, for printing, postage, stationery and minor incidental expenses be paid out of the funds of this Association. (The motion, as so amended, was seconded, put and unanimously carried).

PRESIDENT MCKENZIE: We have with us this morning Prof. Charles N. Gould, Director of the Geological Survey of this State, who has consented to address us on the subject of

THE FUTURE OF NATURAL GAS IN OKLAHOMA.

CHAS. N. GOULD.

In Oklahoma, as in most other regions, natural gas is found associated with petroleum. While it is true that there are in the State a few gas wells in which the amount of petroleum produced is negligible, and there are some oil wells which produce but little gas, the fact remains that in at least 90 per cent. of the wells, both substances are found. This is only what might be expected when the nature of the two products is understood. Petroleum and natural gas are but two manifestations of the same series of chemical compounds, one being the gaseous, the other the liquid form. This being true, it is obvious that any discussion regarding the location of natural gas must necessarily include petroleum also.

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It is not the purpose at this time to enter into any discussion regarding the origin of oil and gas. The smoke of the battle still hangs over us. Partisans of the chemical theory and of the organic theory still contend valiantly. This matter does not concern us today. We do not care whether oil and gas are formed by the action of hot water on carbides of certain metals, or whether it is the result of long-continued distillation of animal and plant remains, which were buried in the rocks in by-gone days. There are just three things which we, as members of the Natural Gas Association of America wish to know: First, Where is the gas located? second, How much is there of it? and third, How can it best be utilized? It is a brief discussion of these three questions as they relate to conditions in Oklahoma, the state which you have today honored by your presence, that I desire to call your attention.

First: Where in Oklahoma has natural gas been found, and where may we expect to find additional deposits?

On the upper right-hand corner of the map which I have placed in your hands, I have attempted to indicate in a general way the location of the oil and gas producing regions of Oklahoma. The cross-barred area indicates what has been called the probable oil field, the region in which oil and gas will probably be found. The area in parallel lines is the possible oil field; and the solid black, the developed fields. By comparing this map with the map of the coal fields, you can not fail to notice that the probable oil field of Oklahoma coincides very closely with the coal field, extending from the Kansas line south about as far as Atoka and east to the Arkansas line. The matter might be stated differently, that is, it might be said that in Oklahoma, oil and gas occur in the Coal Measures rocks.

Coal, which is derived from vegetable matter, is found either in rocks of carboniferous age, or in younger rocks, chiefly cretaceous and tertiary. Oil, which is probably derived from both plant and animal remains, is found in rocks of practically all geological ages, from the Cambrian, the earliest of stratified rocks, up to practically the latest. The oil of the Indiana field, for instance, is found in very old rocks; the Trenton formation, of Ordovician age. Much of the oil in Pennsylvania, West Vir-

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ginia, Kentucky and eastern Ohio comes from Devonian or Mississippian rocks. Oil in the Illinois, Kansas and Oklahoma fields comes from the Coal Measures rocks. At Pueblo, Colo., and Corsicana, Texas, oil is obtained in Cretaceous formations, while the Beaumont oil and the oil in the California fields comes from Tertiary rocks, which are of very recent geological age.

The probable oil field in Oklahoma coincides, then very closely with the coal field. It will be noted that the greater number of productive areas, indicated on the map as solid black lie in the northern part of the State. This is largely due to the fact that development began at the Kansas line, and has moved southward, slowly and methodically. The first wells were drilled along the 96th meridian, and in the Shallow field, so-called, farther east. At the present time, the development has progressed about as far south as Muskogee and Okmulgee. No oil has as yet been found in the probable field south of the Canadian river, but there are geological reasons for believing that within the next few years, when development has progressed that far, some of the most productive pools in Oklahoma will be found in the region between Atoka and the Arkansas line. In fact, it is altogether probable that had development begun near Atoka, McAlester or Fort Smith, only the southern part of the Oklahoma field would have been developed today, and the Muskogee, Morris, Bartlesville, and Glenn fields would have yet been undiscovered.

The area which is designated on the map as the possible oil field of Oklahoma lies west and south of the probable field, extending as a belt from the Kansas line south to the Arbuckle Mountains, passing around these mountains, and east, north of Red river, to the Arkansas line. There is also a small area surrounding the Wichita mountains. Within this area, oil or gas, or both, have been found, at a number of points, namely at Blackwell and Ponca in the northern part of the State; at Madill and Wheeler, south of the Arbuckle mountains, and at Lawton, Cotebo and Granite, near the Wichita mountains. It is extremely probable that future development in these regions will reveal the presence of a number of additional pools. The chances, how-

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ever, for finding oil and gas in this region are not so good as in the region designated as the probable oil field.

There are five general regions in Oklahoma in which the chances are not good for finding oil and gas, namely: The centers of the four mountain regions and the great Redbeds area which occupies central and western Oklahoma. The Ozark Uplift in the northeastern part of the State; the Ouachita mountain region in the southeastern part; the Arbuckles in the south central part and the Wichitas in the southwestern, show no possibilities for oil or gas. In addition to these four doubtful areas, it is unlikely that oil or gas will ever be found in quantity anywhere in the Redbeds. At various times drilling has been done and a great amount of money has been spent in the Redbeds in the central and western counties. It has been estimated that during the last ten years at least $25,000 a year, or a quarter of a million dollars in all, has been spent in drilling holes in the Redbeds in the vain hope of finding oil or gas, and up to the present time, not a dollar has ever come back.

The geology of the oil and gas fields of northeastern Oklahoma is comparatively simple. The rocks consist of a series of alternating beds of sandstones and shales with a few limestone ledges, belonging to the Coal Measures age. The greater part of these rocks lie nearly level or dip at low angles to the west, the average dip being perhaps 20 feet to the mile. In certain places this regular westward dip is interrupted by folds, that is, anticlines and synclines, which run usually nearly parallel to the strike of the rocks; that is to say the axes of the anticlines and synclines run nearly north and south. In many places where there is no well marked anticline it may be noticed that the rocks instead of dipping west, lie nearly level, forming what is sometimes known as an arrested anticline.

It is not necessary to stop here and explain to members of this association the well-known anticlinal theory of oil and gas formation, promulgated by Dr. I. C. White, State Geologist of West Virginia, and others. According to this theory gas should, under normal conditions, be found most abundantly along the axis or crest of the anticline; oil along the slopes of the anticline; while water, usually salt water, occurs in the syncline.

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While it would not be correct to say that this theory holds good in all places in Oklahoma, the general statement may be made that the greater number of the oil and gas fields in northern Oklahoma are in regions where the normal westward dip of the rocks has been interrupted. In many fields, as for instance, near Bartlesville and in the Glenn Pool, there is a well-marked anticline. Some three years ago, I had the privilege of standing with Dr. White on one of the isolated knobs near the eastern end of the Glenn Pool not more than half a mile from the Ida Glenn lease, from which the pool takes its name, and with him tracing out the location of the axis of the anticline along which the great part of the strongest gas wells in the pool occur. On the other hand, there are oil and gas fields in Oklahoma where the geological structure is more obscure and where there are no anticlines which may be observed from the surface.

Another factor which must always be taken into consideration in Oklahoma, as well as other known oil fields, is the shape and lithologic character of the oil and gas-bearing sands. If the sand is thin, it can hold but little oil or gas; if it is thick, it can hold much larger deposits. If the sand is fine-grained and practically impervious, but little oil or gas can pass through it. If it is coarse-grained and porous, large amounts of oil or gas may be stored up. So that other things being equal, the thicker the sand and the more porous the material, the larger the amount of oil or gas contained therein. Thin beds of fine-grained sand can carry but little if any, oil or gas. From this it will be readily understood that the most prolific oil or gas fields must necessarily occur in regions where a thick bed of porous sand is located along an anticline. These conditions seem to obtain at Glenn Pool, where the sand is more than 100 feet thick, as well as at Bartlesville, in the Muskogee field, and at a number of other prominent fields in the State. Wherever a pumpkin-seed-shaped bed of porous sand occurs in a region where the rocks either lie level or where there is a pronounced dip to the east, oil and gas have usually been found. On the other hand, in several cases, dry sands of considerable thickness have been found along anticlines, while along others only thin sands carrying a small amount of oil have been encountered.

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All this is to say that while a geologist may often be of some practical benefit to the oil man in the matter of eliminating risk and indicating the locality where *not* to drill, he can never be absolutely certain that oil or gas, or in fact, any other mineral, exists beneath the surface. The only way to determine certainly the presence of these substances is to drill.

Even if no drilling had ever been done in Oklahoma, it would not be difficult to argue the presence of oil or gas beneath the surface. There are a number of places in the State where asphalt, the residuum of petroleum, appears on the surface. Several of these localities are in northeastern Oklahoma at points where we now know that oil and gas-bearing sands appear on the surface. Asphalt occurs in considerable quantities in the vicinity of the Arbuckle mountains also, for instance, near Ada, where lower Carboniferous rocks approach the surface.

Burning springs are found in several parts of the State, the most notable being in northeastern Pittsburg county, some 20 miles northeast of McAlester. At this point, gas escapes over an area of perhaps 300 square feet, along a little ravine. It issues from crevices in the soil and among the rocks, and when set on fire often continues burning for weeks and even months. It is extremely significant that this spring is located near the crest of an anticline. Drilling near this burning spring has, however, revealed no oil and but a small quantity of gas.

The geologist well understands that oil springs and gas escaping on the surface usually means that the chances are not good for finding a large amount of the material at hand. If the spring occurs along an anticline, it frequently means that the rocks have been fractured and the material now escaping has been escaping for a long time and is, therefore, practically exhausted. If found in a region of gently tilted rock, it indicates that the hydrocarbon has been carried for a considerable distance, probably for several miles along the bedding plane, and that drilling should be done at some point other than in the vicinity of the spring. These facts, however, are not always understood by the so-called practical oil driller, and much money has been spent in Oklahoma in attempting to find oil or gas near oil springs or gas vents.

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In Oklahoma, as in other states, the natural mound hallucination is prevalent. Throughout a number of the eastern counties, the flat prairies and even the wooded areas are often dotted with small natural mounds, varying in size up to 50 feet in diameter and often 3 or 4 feet in height. The superstition that these mounds in some way indicate the presence of gas is wide-spread. They are called gas blows or gas mounds, and many people really believe that a well put down in the middle of one of these mounds will encounter gas. It is needless to say that this notion has no foundation in fact and whatever may be the origin of these natural mounds, they are not connected in any way with any deep-seated supply of gas.

Second: This brings us to the second division of our subject; namely, How much natural gas is there in Oklahoma? The answer is easy. Nobody knows.

All that we can say is that the deposits are enormous, but at the present time there are not sufficient data to enable us to estimate accurately their possible amount. Practically every oil well so far drilled in the State produces gas, while at the same time many of the strongest gas wells do not contain oil. The daily capacity of an Oklahoma gas well varies from a few cubic feet per day up to millions of cubic feet. The average sized well in the Tulsa or Bartlesville region runs all the way from 1,000,000 to 10,000,000 cubic feet per day. Wells in various parts of the State have been reported to produce 40,000,000; 50,000,000 and even 60,000,000 cubic feet per day.

According to the statistics of the United States Geological Survey, there were, at the close of 1908, 474 gas wells in Oklahoma. This is probably not more than half the actual number now in existence. Gas wells are strung all along the 96th meridian from the Kansas line to Henrietta. Some of the strongest wells with a capacity running up into the tens of millions of feet per day are located in the Shallow field, the Morris field, the Bald Hill field and the Muskogee field, while other wells equally good are located at Wainwright, Pawhuska and in the Preston Pool. Smaller amounts have been found in dozens of localities scattered everywhere throughout the field.

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Any estimate of the amount of gas actually in sight in Oklahoma is little better than a guess. There are no accurate data and even an approximation may of necessity be misleading. Taking into account all known facts, however, and estimating as nearly as possible the amount from the various wells, including those now being utilized, those shut in, and those going to waste, the amount of gas already discovered in Oklahoma should be somewhere between 1,500,000,000 and 3,000,000,000 cubic feet per day. A conservative approximation would probably be 2,000,000,000 cubic feet daily.

But if we attempt to go a step further from a conjecture as to the amount of gas which may yet be discovered in Oklahoma, we are at once confronted with the inadequacy of language and the paucity of figures. Those of us who have traveled over the developed fields of Oklahoma studying the problem from a scientific standpoint, believe that at the present time not one-fifth, or possibly not one-tenth of the gas in those fields has yet been touched. In many cases only a single well to the square mile has been drilled in search of oil. Gas having been found, for which there is no demand, the entire territory has been condemned, and the field abandoned. Possibly the well has been plugged, but most likely it still stands open, permitting the escape of the gas.

Now from a study of the map it will be seen that not one-tenth of the probable gas field of the State has been developed. In the region south of Muskogee and Okmulgee there has been practically no drilling as yet, but this is a region in which the geologist believes that there should be vast untapped reserves of gas and oil. Even the geologist with his well-known inclination to estimate things in hundreds of millions, stands aghast before the unknown possibilities of the future development of the Oklahoma gas field.

Natural gas is now being utilized to a limited extent for manufacturing and domestic purposes in the region in which it is produced. Such towns as Bartlesville, Dewey, Cleveland, Collinsville, Mounds, Wagoner, Claremore, Morris, Boynton, Wann, Blackwell, Chelsea, Bigheart, Pawhuska, Taneha, Ochelata, Ramona, Tulsa, Skiatook, Nowata, Talala, Lenapah, Sapulpa, Ok-

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mulgee, Muskogee, Ponca and Coweta use gas, produced usually within a few miles of the city, for lighting and heating purposes. In a number of cases, gas is used for industrial purposes. For instance, Bartlesville has zinc smelters, Dewey has a Portland cement mill and a number of towns in the gas fields have brick plants that use gas. A pipe line from the Tusla-Glenn Pool region supplies Oklahoma City, Edmond, Guthrie, Chandler and Shawnee. Ardmore uses gas piped from the Wheeler field 20 miles distant.

The price of fuel varies directly with the distance it has to be piped. In Tulsa and Bartlesville, to cite two examples, where the gas is produced near at hand, prices are about ten cents per thousand cubic feet for domestic use and two to four cents for manufacturing purposes. Several towns in this region have advertised two-cent gas and one and one-half cent gas for factories. In Oklahoma City, where the gas is piped over a hundred miles, the price is twenty-five cents per thousand for domestic use and ten cents for factory use.

It is obviously impossible to accurately estimate the life of the oil and gas fields of Oklahoma. Ordinarily these substances are exhausted within a few years after the reservoir containing them has been tapped. It is well known that the life of the ordinary oil well or gas well does not usually exceed five years. Some of the wells are exhausted in a year or two, others produce a small quantity of oil for ten, twenty, or even forty years. Some of the first wells drilled in Pennsylvania in the late 60's are still producing. On the other hand, the famous Beaumont field, which was at one time the wonder of the world, is now practically exhausted. The Indiana gas field is nearly exhausted. Many of the first wells drilled in southern Kansas and northern Oklahoma have already ceased to produce oil or gas in paying quantities.

It must be remembered, however, that as I have already stated, only a relatively small part of the oil and gas region of Oklahoma has ever been prospected and a still smaller part developed. There is enough prospective territory untouched in Oklahoma to keep the drillers busy for the next fifty years. Counting fifty years more for the life of the last wells brought

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in, and assuming that the greater part of the gas will be utilized and not permitted to go to waste, we may approximate 100 years as the life of the oil and gas field of Oklahoma. This estimate is probably under, rather than over the actual time limit.

At a conservative estimate not to exceed 10 per cent., possibly not more than 5 per cent. of the gas so far discovered is now being utilized. Part of it is shut in waiting a chance for utilization, but much of it is going to waste. One can not drive anywhere through the gas field of northeastern Oklahoma without being shocked at the prodigal waste of fuel now going on. In hundreds of places, gas is permitted to burn day and night without ceasing. Scores of wells are permitted to flow unchecked, and this priceless fuel is being dissipated into the air. A law which was passed by the last legislature, the object of which was to attempt to conserve the natural gas, has done much to check this waste, but in many sections it is yet more honored in the breach than in the observance. At the present time in Oklahoma a vast amount, possibly hundreds of millions of cubic feet a day of the best fuel the world has ever known, is permitted to escape into the air.

In territorial days little attempt was made to save the gas. To cite but one instance out of a hundred; when gas was first encountered in Bartlesville, it was permitted to escape unchecked. The roaring of the gas was so persistent that people in the town could not sleep at night, and so the gas was carried in pipes outside of the city limits, where it might escape without the noise disturbing the sleepers.

The following paragraph from a current periodical will give some idea of present conditions in the State.

"The party took a run down to the new Preston oil field. While there accurate measurements were made of the gas well recently brought in, and it was shown to be good for 36,000,000 cubic feet per day. This is the largest gas well ever developed in the southern Creek country and one of the largest that has been completed recently in Oklahoma. Its magnitude was a surprise, even to the owners of the well. It has been running wild ever since it was brought in and the roar of the escaping gas can be heard for miles. The owners are purposely allowing the

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gas to go to waste with the belief that the well will finally drill itself into oil."

The following quotation from a letter written April 4th, 1910, by a member of your association will give an idea of the situation from the view point of a practical gas man:

"There are millions of feet of natural gas going to waste in this State, due largely to carelessness and neglect by the many producers in drilling for oil. It seems their sole aim is to drill through the gas bearing strata in order to secure the oil, as the oil can be marketed more readily and the gas has a very limited market. While this is being done the gas is allowed to go to waste; in fact very little attention is paid to it. In many cases the well is drilled into salt water, which destroys it entirely as a gas well. Only recently in the new Hamilton Switch pool there have been no less than fifty to seventy million cubic feet of gas blowing away, in fact, enough to supply the whole state of Oklahoma, every day, with apparently no effort on the part of the producer to prevent it. There are some of the wells in this Pool which came in having a capacity as large as 36,000,000 cubic feet per day. We feel that the gas is just as marketable and valuable a product as the oil and that a well which is drilled in having a capacity of from two to four million cubic feet per day should be shut in to save the gas, as it looks like a crime to allow the gas to go to waste in this manner."

It is greatly to be regretted that some really effective plan has not been devised to curtail the prodigal waste of this valuable fuel, which has been going on in eastern Oklahoma for the past ten years, and which is still in progress. For this there is no excuse except the cupidity of man. The well having been drilled, in search of oil, and gas having been encountered, for which there is no immediate demand, it is easier to pull the tools, letting the well stand open, permitting the escape of the gas, than it is to plug the well. In many cases, as the one above cited, a gas well with a capacity of many millions of cubic feet per day is permitted to flow unchecked in the hope that it will some day drill into oil. In scores of instances wells which produce ten or twenty barrels of oil and say 5,000,000 or 10,000,000 cubic feet of gas a day are permitted to flow unchecked.

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The gas is all wasted to save the small amount of oil. When it is remembered that 6000 cubic feet of gas has a fuel value equivlent to a barrel of oil, it will be understood that 6,000,000 cubic feet of gas equals a thousand barrels of oil. So in the case cited the equivalent of 1000 barrels of oil, is permitted to go to waste each day in order to save ten or twenty barrels. For these reasons, Oklahoma is day after day losing hundreds of thousands of dollars worth of valuable fuel, which should be saved for future generations. This waste is nothing short of criminal, and it is high time that the people of Oklahoma, as of other gas-producing states, were awakening to a realization of conditions.

One point should be clearly kept in mind, namely that these fuels, once gone, are gone forever. You may take all the water from a well and the rainfall will restore the water. You may exhaust the fertility of the soil, but by careful cropping and fertilizing, the fertility may be renewed. You may cut down the forests, and new forests will grow, but when you take from the earth the minerals, the oil, the gas, the coal, contained therein these minerals are never replaced.

In this connection it may not be out of place to quote a statement made by Dr. White at the congress of governors at Washington two years ago:

"For just as sure as the sun shines, and the sum of two and two is four, unless this insane riot of destruction and waste of our fuel resources which has characterized the past century shall be speedily ended, our industrial power and supremacy, will, after a meteor-like existence, revert, before the close of the present century, to those nations that conserve and prize at their proper value their priceless treasures of carbon."

Third: How may this vast amount of fuel be best utilized?

By referring again to the maps showing the distribution of the mineral resources of the State, and comparing these with the oil and gas map, you can but note the proximity of the gas belt to most of the other minerals. Now by referring to the chart showing the approximate abundance of the minerals, you may be able to form some idea as to the ultimate utilization of our gas.

Oklahoma is rich in mineral. Few states surpass us either in

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variety or amount. But today this mineral lies dormant in our hills and not one-half of one per cent. of it is being utilized. We, in Oklahoma, use Kansas brick, tile, cement and salt; Arkansas and Texas alike; Vermont marble; Scotch granite; Texas gypsum plaster; Indiana and Missouri limestone; Illinois glass sand, and asphalt from the oil refineries, and we pay the freight on all of it, although we have inexhaustible deposits of all these materials in our own hills. The reasons for importing these products are obvious. The other states have their mines and quarries opened already, and their plants established, while we have not.

Oklahoma is the baby state. There are nearly two million of us here and we are all from somewhere. I'm from Ohio. My next door neighbor is from Texas, and the man across the street hails from Wisconsin, while his neighbor is from North Carolina. We came here of our own volition because we knew that Oklahoma had the makings of the grandest state of the Union. We understood when we came that we were coming to a new state and so we are willing to endure pioneer conditions just as long as necessary, but no longer. We are proud of the fact that no equal area that the sun shines upon has made such rapid advancement in the same length of time as has Oklahoma in the past five years, and we are yet only fairly started. Get out of the way and watch us grow, or better still, cast your lot with us and help us grow.

We are *trying* to keep our gas at home. We need it. It is true that we have been wasting it about as fast as we could, but at the same time, we don't want you all to take any of it away. What we do want is for you to locate factories here that will utilize our fuel. We have a plenty and to spare. If the gas fields are ever exhausted, we have a few billion tons of coal to fall back on. (The United States Geological Survey says we have 75,000,000,000 tons) but we are not worried about the gas failing for several years yet. But right in the gas fields or within short piping distance, there are inexhaustible deposits of as good clay as that found in Ohio or New Jersey; of as fine glass sand as that of Illinois or Pennsylvania; of Portland cement rock as good as can be found anywhere in the world. There is also lime-

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stone for burning into lime; lead and zinc deposits among the most prolific on the continent, besides sandstone, marble, granite and asphalt, all in enormous quantities. A little farther away, there are 123,000,000,000 tons of gypsum, and salt water enough going to waste to make 100 car loads of salt a day.

At the conclusion of the reading of the paper, which was interspersed with interesting comments and pertinent remarks, Prof. Gould was greeted with prolonged applause.

MR. M. M. SWEETMAN: I move you that we tender a vote of thanks to the Professor for his very valuable paper.

The motion was seconded.

Thereupon, Mr. F. W. Stone was greeted with hearty applause when he was presented by the President, and proceeded to read the:

WRINKLE DEPARTMENT.

F. W. STONE, EDITOR.

INTRODUCTION.

To the Members of the Natural Gas Association of America:

Considering that the natural gas business is one that in its practical operation requires the exercise of considerable ingenuity and ability to cope with unexpected conditions, the response to the request for material for the Wrinkle Department has not been as ready as it was hoped it would be. This may be because of a feeling of diffidence on the part of some members and a lack of knowledge of the scope of the Wrinkle Department on the part of others.

The thanks of the Editor of the Department are tendered to those who did contribute and it is with pleasure that he submits to the Association the following wrinkles.

F. W. STONE, *Editor.*

WRINKLE NO. 1.

CONTRIBUTED BY J. H. WILLSEY, ASHTABULA, OHIO.

TRUCK FOR CARRYING ADDING MACHINE SO AS TO ENABLE IT TO BE USED FOR MAKING THE ADDITIONS IN GAS LEDGERS.

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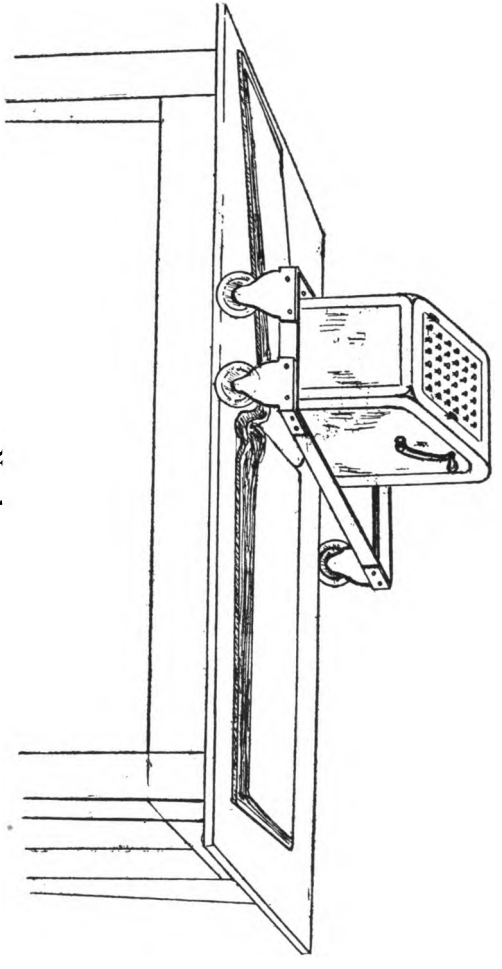
The frame of the truck is made of $1\frac{1}{4}'' \times \frac{3}{4}''$ angle iron and spans from one side of the flat desk or table to the other. The wheels and supports raise the truck a sufficient height so that it



No. 1.

will readily pass over the gas ledger. The additions are easily made and the machine pushed to one side when making the balance.

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WRINKLE NO. 2.

CONTRIBUTED BY CHAS. D. BELL, PARSONS, KANSAS.

In driving piles preparatory to the building of a subway under the railroad tracks, a pile was driven by the railroad company through a 10" low pressure line. This 10" line had a gate valve on one side of the railroad track, but the main line piping was so arranged that the gas would still flow from the other direction and could not be shut off without shutting off fifteen hundred consumers. A temporary repair was made by mixing concrete and filling it in around the pile. No. 10" gas main bags were available and in order to stop the flow of gas so that the pile might be taken out and a permanent repair made, I tapped three holes for ⅜" pipe and screwed three pieces of pipe in them with long threads so that they would cross one another and reach to the opposite side of the pipe from where the tap was made. Back of that I tapped a 2" hole and put in muslin which had been cut into strips about 8" wide with the ends tied together so as to make one string. The gas drove the muslin up against the ⅜" pipe and stopped the flow, after which I cut the line and put in a permanent gate. The repair was made without inconveniencing any of my customers.

After getting the damaged piece uncovered so that it could be examined, I was astonished to find the pile did not have a steel point on it, and was still further astonished to find the pipe was flattened but very little. The pile had gone through the pipe from the top, having struck it a little south of the center of the pipe, and another pile being close to that side of the pipe, kept it from glancing off or breaking through the side as would otherwise have occurred.

WRINKLE NO. 3.

CONTRIBUTED BY J. H. WILLSEY, ASHTABULA, OHIO.

EASEL ARRANGED FOR HOLDING GAS LEDGERS SO THAT THEY MAY BE ADDED BY AN ELECTRICALLY OPERATED ADDING MACHINE.

The sketch explains itself:

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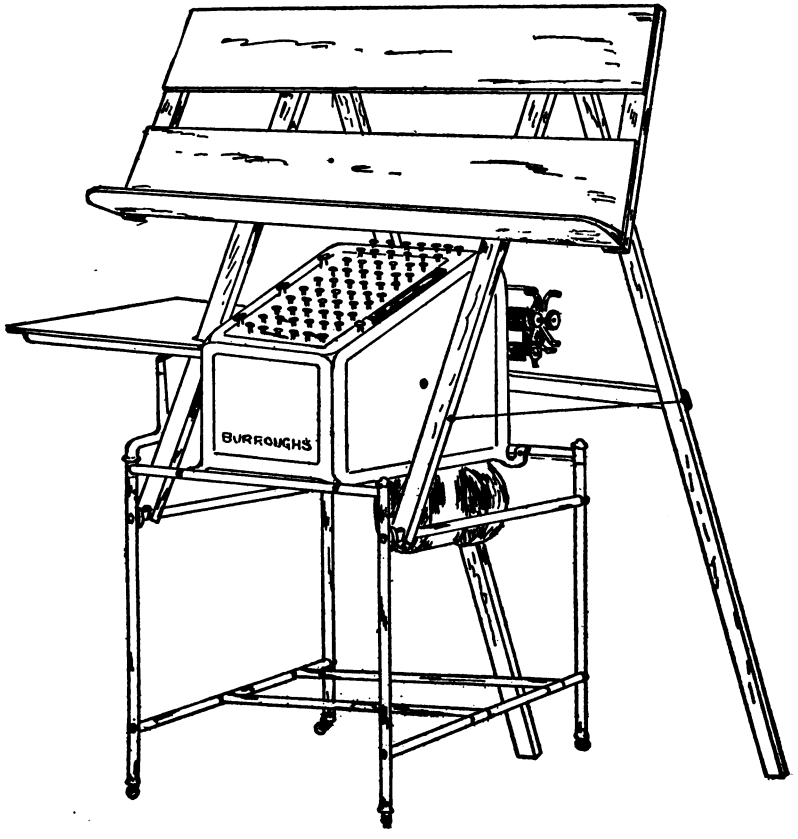
WRINKLE NO. 4.

CONTRIBUTED BY A. SAYBOLT, WOOSTER, OHIO.

AN EQUIPMENT FOR FIRING HOT WATER OR STEAM BOILERS WITH GAS AND AT THE SAME TIME ALLOWING THE USE OF COAL.

The clean out doors are taken off and ordinary blow pipe burners are turned into the flues. The door is then bricked up. leaving a small opening which is covered with a piece of mica for the purpose of observing the flame. The burners can be used during moderate weather and the coal fire allowed to go out, or they can be used in extremely cold weather as an addition to the coal fire.



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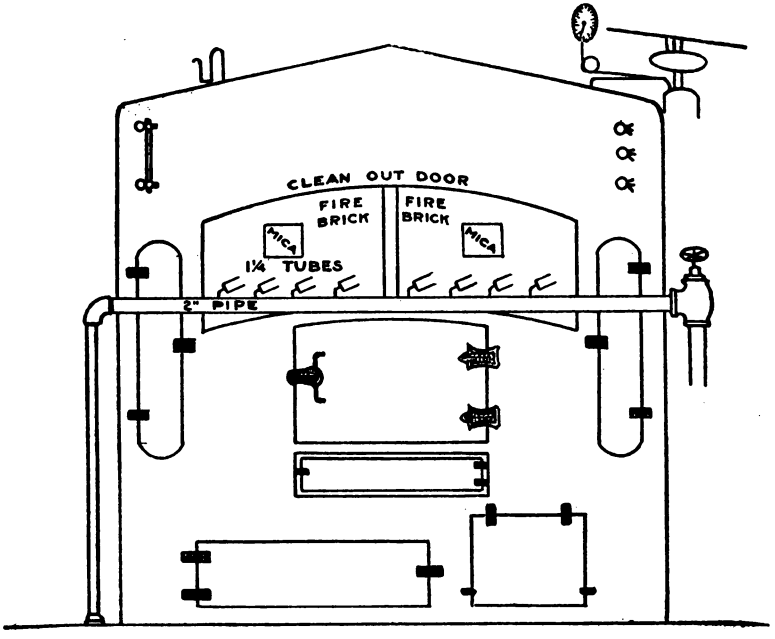

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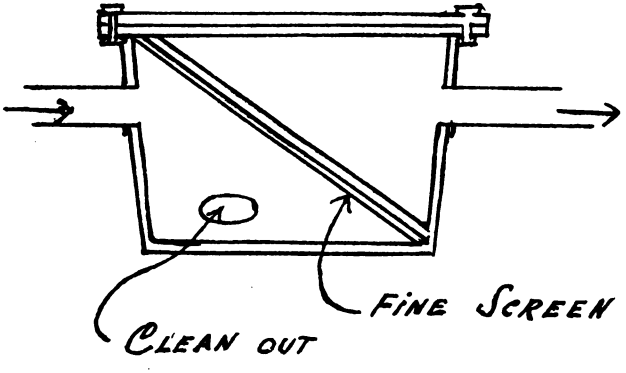

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WRINKLE NO. 5.

BOX FOR COLLECTING DIRT OR DUST AND PREVENTING ITS ENTRANCE INTO THE REGULATOR.

At one place we were so troubled with the accumulation of dust or dirt in the regulators that it kept two men on duty constantly cleaning regulators and changing from one to another. We finally became tired of this and devised a box as sketched below.

The box was about 2 ft. long and 18″ square. The lower part was cast in one piece. The top was bolted on. The sides, bottom, and top were ribbed to give the necessary strength. A cast iron plate perforated with holes about ¾″ in diameter and placed as thickly together as possible, was placed diagonally across the box as shown in the sketch. The lower end of the plate being held in position by a lug and the upper end being held down by the cover of the box being bolted against it. Fine wire mesh was stretched across the under side of this plate. The gas entering the one end of the box below the plate, passed through the wire mesh and holes in the plate and was discharged at the other end.

A hand hole similar to those on a boiler was provided for cleanout purposes. The screen could be cleaned by simply reaching up through the hand hole, the slow passage of the gas through the box and the screen, together with the capacity of the box, took out all of the dirt and it was only necessary to clean them about once a day, instead of having men constantly on duty as before.

WRINKLE NO. 6.

CONTRIBUTED BY E. B. SMITH, COSHOCTON, OHIO.

ENTRANCE OR WINDOW LIGHTING SCHEME.

WRINKLE NO. 7.

CONTRIBUTED BY H. R. ROGERS, NEWARK, O.

The cut explains itself.

The method of operation is very simple and the screen can be cleaned without removing the regulator from the line. Sim-

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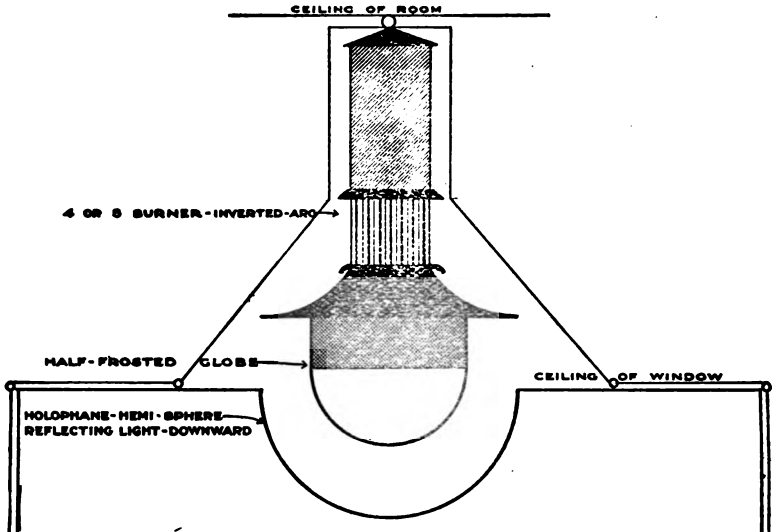
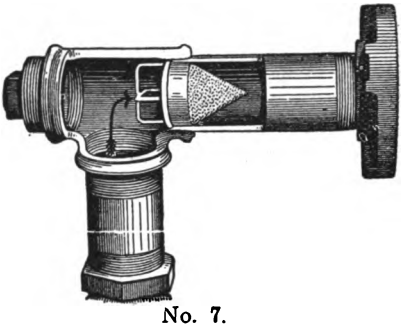


Cut out space in ceiling of window and insert 15½" Holophane Hemi-Sphere. Over the Hemi-Sphere hang a 4 or 5 burner inverted arc lamp, with half-frosted globe, high enough to allow, removal of globe for renewing mantles.

Lamp may be lighted from floor by extending a light wire from shut-off arm to ceiling of window, passing it through small screw-eye and dropping it over the rear of window.

A brilliant and attractive light is given in the window and color schemes may be worked out by lining the Hemi-Sphere with colored tissue paper.

No. 6.



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ply remove the plug from the tee and draw the screen through the opening.

These screens have been home-made, but an improved one is now being placed on the market.

WRINKLE NO. 8.

CONTRIBUTED BY A. C. HARTZELL, GREENVILLE, PA.

A DEVICE FOR ENABLING METER MEN TO CARRY METERS ON THE FRONT OF A BICYCLE.

Five-sixteenths inch round iron is bent into a triangular shaped piece, the two ends arranged so as to slip into or clasp the fork of the bicycle, the wide part of the triangle projecting in front. This is supported or braced by pieces of fence wire extending back and upward and hooking over the handle bars.

Meters can be carried in this way with very little jar, always stand upright, and give the fitter the free use of his hands in steering the wheel.

WRINKLE NO. 9.

CONTRIBUTED BY F. W. STONE, ASHTABULA, O.

A RACK FOR GAS LEDGERS WHERE MORE THAN ONE LEDGER IS BEING HANDLED BY THE BOOK-KEEPER.

The rack is divided into shelves with just sufficient space between the shelves to admit of a gas ledger. A roller is placed in front of each shelf, the top of the roller projecting from $\frac{1}{4}''$ to $\frac{1}{2}''$ above the shelf. The end of the gas ledger is placed on the roller and the ledger then pushed into position. The roller carrying the weight of the ledger and allowing it to very easily go into place.

This obviates the necessity of lifting one ledger over another and any ledger is instantly available.

WRINKLE NO. 10.

CONTRIBUTED BY R. M. STOTTLER, KANSAS CITY, MO.

In our business we have adopted what is known as the map and tack system for keeping track of prospective purchasers

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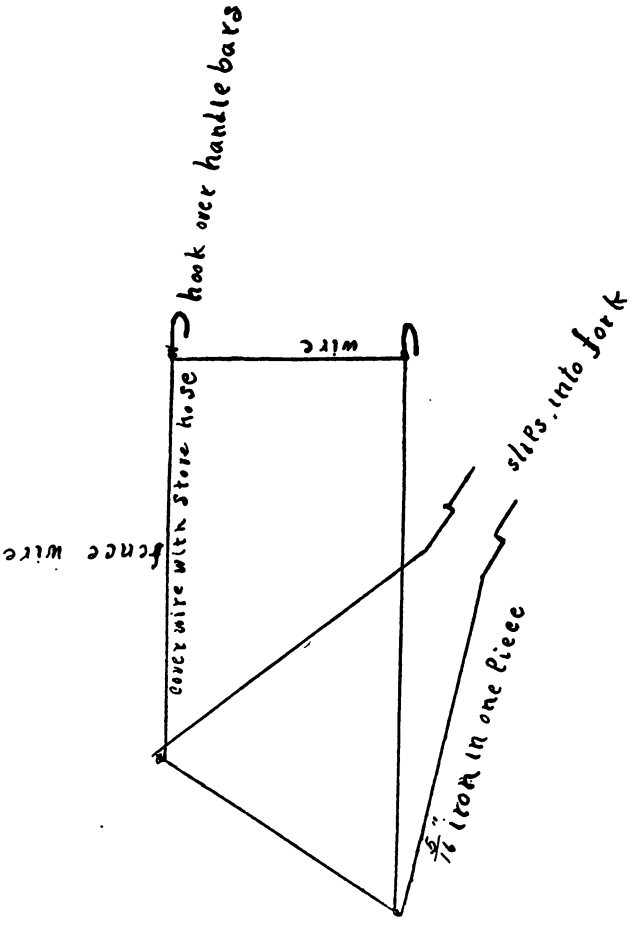
of meters, and we believe that the system is used by and is familiar to some of the largest gas companies, but may not be known to a good number of the fraternity. We provide a drawer and map for each state, and put a tack in each town where there



No. 8.

is a water-works or a gas plant, and then by using different colored tacks, we can tell at a glance whether or not our salesman has visited the town; whether we are or not getting business from the town, and whether or not we have any business pend-

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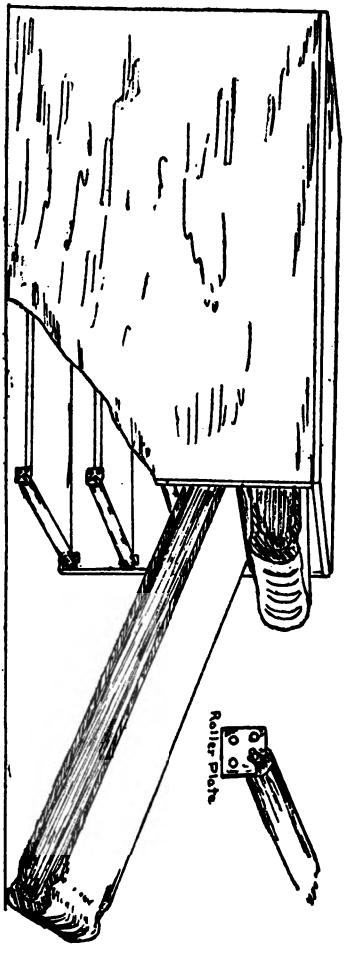
ing in any town at that particular time. The writer believes that some such a scheme would be valuable to a Gas Company in informing them of the location of every possible consumer;



No. 9.

whether or not they are already connected up to the gas company's mains, and by using a variety of colored tacks, other information could be shown, such as the location of domestic and power consumers, active and inactive meters, etc.

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EDITOR'S NOTE:

The Editor has used this scheme to good advantage, using pins having various colored heads instead of tacks. By placing the proper colored pin on the map, a person can see at a glance just what sections of the City are using gas and where there are residences or business places having no connections or connections which are not being used.

WRINKLE NO. 11.

A DEVICE FOR COLLECTING DIRT OR DUST AND PREVENTING ITS ENTRANCE INTO REGULATORS.

In front of the regulator screen, a 4 x 4 x 8" tee was placed. The 8" side opening being turned downward. Into this was screwed a piece of 8" pipe about 2 feet long with a cap on the lower end. The reduced rate of flow of the gas traveling through the tee, causes the dirt to drop out and settle in the 8" pipe. It was removed by shutting off the regulator and unscrewing the cap.

WRINKLE NO. 12.

The following questions, while not properly belonging to the Wrinkle Department, were submitted to me with a request that we obtain answers.

QUESTION 1.

"What percentage of loss in B. T. U. is there, if any, in natural gas that has been put through a compressor at 250 to 300 lbs. pressure and gasoline extracted from the same at a rate of from four to six barrels a day, on a ten inch line, with a delivery of from 14 to 15 million cu. ft. per day; the gasoline being formed because of the cooling process which is necessary after gas has passed through the compressors, and is taken off at drips along the line?"

A request for answer to this question was sent to several persons, but only one returned a reply, which was as follows:

"Ordinary gasoline contains approximately 20,000 BTU to the pound, therefore 5 bbls. — 42 gal. each, would contain approximately 25,000,000 BTU. 15,000,000 cu. ft. of gas, if prac-

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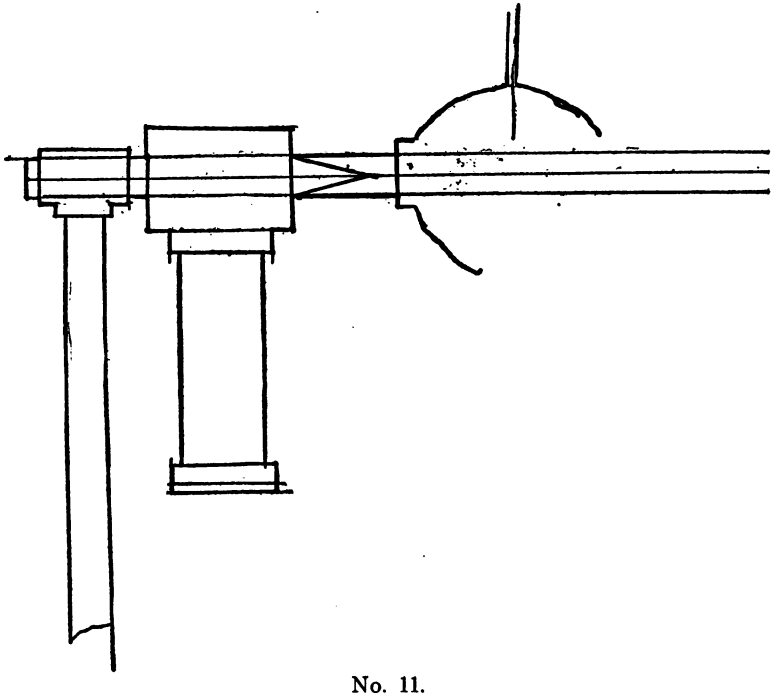
tically pure methane, would contain approximately 1,000 BTU to the foot, or 15,000,000,000 BTU. If the gasoline condensed was carried in suspension by the 15,000,000 cu. ft. of gas, then the same would sustain a loss of approximately $\frac{1}{5}$ of 1% in heating value. The facts, however, probably are that the gasoline added to the vapor tension of the mixture, it consisting of denser volatile hydro-carbons of the propane (C_3H_8) butane



No. 11.

(C_4H_{10}) classes and containing heat units approximately twice the number contained in methane. These volatile hydro-carbons exist as a gas in the mixture until the increased pressure cause them to condense and the 25,000,000 BTU would probably contain approximately 15,000 cu. ft. of gas. This quantity of gas added to the 15 billion is such an infinitesimal that it does not appreciably change the percentage. One is therefore

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warranted in stating that the natural gas loss is ⅛ of 1% of its heating value by the extraction of the gasoline. However, if the gasoline had not been been extracted but had remained in the line, it would have again been evaporated as the gas expanded further down the line and it would again have obtained its full heating value. The extracted gasoline, however, probably has a value nearly ten times more than the gas that would have been formed therefrom."

W. H. HAMMON.

QUESTION 2.

"Is it possible for the Flag arm on a regular two diaphragm tin meter to become loose, or twisted on the flag wire, where the two have been properly soldered together, thus causing the valves to be placed in such a position that the gas will not pass through the meter when connected up properly, and every other part of the meter be in normal condition, unless the meter has been set with the gas coming into the outlet side and passing through; or, in other words, the meter set backwards?"

Three replies were received to this question which were as follows:

"Provided the meter was in good working order when set and remained in good working order, it would be impossible for the flag arm to become loose unless the meter had been set backwards. If, however, the valves became clogged with gummy substance so as to cause extreme friction, this might break the solder joint on the flag wire and it would really be fortunate to have this break occur as it would notify the gas manager of the bad condition of the meter."

A. G. HOLMES.

"If the flag arm would become loose or twisted on the flag wire so the diaphragm would reach the end of the stroke before the valves were sufficiently shifted to allow the gas to enter the other side of the diaphragm, the meter would stop and no gas would pass through the valves."

GEO. W. BARNES.

"As to a flag arm on a meter becoming loose, I will say that it is possible for it to do so but not probable. We have

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meters returned to us occasionally having one flag arm loose but in every case within our recollection the breaking away of the flag arm from the flag wire has been due to backward pressure exerted on the meter, caused no doubt by testing the house pipes under pressure without removing the meter.

A stop is provided in meter to prevent its working backward and with the pressure on the diaphragm at that point, something must give, and the most natural point to do so is where the flag arm is soldered to the flag wire. This soldering is usually done as securely as possible and, to make a direct reply to the question, I would say that under ordinary circumstances, a flag arm will not break loose from a flag wire in a two diaphragm tin meter unless backward pressure is exerted on the meter."

JNO. D. MCILHENNY.

At the conclusion of the reading of the paper Mr. Stone was again applauded.

MR. J. M. GARARD: Mr. President, I don't know whether there is going to be any discussion, but I want to get my work in first. I move you that a vote of thanks be tendered to Mr. Stone for his contribution to the Association, and along the same line I move you that he be elected to the same office for the coming year. I make those two motions in one. (Applause.)

PRESIDENT MCKENZIE: Stand up. It is unanimously carried.

MR. F. W. STONE: I want to thank the Association for their vote of thanks. But I want to say that the Wrinkle Department cannot be conducted by the editor alone. The success of it will depend altogether on the members of the Association. If they are willing to jump in and send me the stuff, I will try and work it up and use it, but I haven't gray matter enough to work up all the wrinkles for the Association. I would work more wrinkles on my own head.

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ELECTION OF PROFESSOR CHARLES NEWTON GOULD TO HONORARY MEMBERSHIP.

MR. W. H. HAMMON: We are honored in having as honorary members of our Association at the present time two or three state geologists who have served us, and I would like to have our friend here elected an honorary member. I would put that as an amendment to Mr. Sweetman's motion.

MR. M. M. SWEETMAN: Put the motion and carry the amendment with it.

The motion, as amended, was then put and unanimously carried by a rising vote.

Professor Gould then thanked the Association, saying that the Oklahoma Geological Survey stood ready to render service in the future as in the past.

PRESIDENT MCKENZIE: The next business is the report on the Committee on the next place of meeting. Mr. Holbrook, I believe, is Chairman of that Committee.

Mr. D. O. Holbrook then read the report as follows:

REPORT OF COMMITTEE ON NEXT PLACE OF MEETING.

GENTLEMEN: Your committee on next place of meeting beg to report as follows:

New Orleans, St. Louis, Niagara Falls and Pittsburg have extended invitations for us to be their guests with the meeting of 1911.

New Orleans offers many novelties in the form of entertainment, and assures us a hearty welcome and generous hospitality.

St. Louis assures us of the hearty support of all the commercial bodies, and an opportunity to visit the most prosperous and thriving city of the United States.

Niagara Falls offers unsurpassed hotel facilities, great natural scenery and many sights that can be seen only there.

Pittsburg offers everything that all the others do, and we have the personal assurance of many of the leading men of the

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city that they will use every effort to surpass the record of all previous conventions.

The committee recommends that the convention of the Natural Gas Association of America be held in Pittsburg, Pennsylvania, on the dates specified in the By-Laws.

DAVID O. HOLBROOK,
ALEXANDER B. MACBETH.

Secretary Jones then moved the adoption of the report, which motion was numerously seconded, and, amidst hearty acclaim, was unanimously carried.

PRESIDENT MCKENZIE: Next is the report of the Committee on the President's Address. Mr. Garard, will you please take the Chair?

Vice-President Garard then assumed the Chair, and Mr. L. S. Bigelow, as Chairman of the Committee, read the report as follows:

REPORT OF COMMITTEE ON PRESIDENT'S ADDRESS.

In admonishing the Managers and Superintendents of Gas Companies to more carefully educate the employees of their companies to a better appreciation of the dignity of their calling and the necessity for loyalty to their employers, in their constant touch with the public, the President dwelt upon a very important and essential matter, and your Committee would urge careful consideration of this recommendation.

Second: In pointing out the inevitable increase in price of natural gas to the consumer, the consequent necessity for more economical and efficient appliances for the producing of light, heat and power became at once apparent. And here again, there should be appreciative attention given to a warning note that, spoken in advance, should awaken the manufacturers to the necessity of taking active measures to produce, without delay, the best that their ingenuity can devise. The automobile engine of but a short while since as compared with the automobile engine of today, stands, for instance, as an example of

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development based upon demand. Let us see this degree of improvement and development in our gas appliances, since the demand is here with us. At the same time, your committee wishes to express appreciation of the immense strides made by the manufacturers along these very lines, and as well to bespeak for the manufacturers appreciative co-operation upon the part of the gas men.

Third: In touching upon the lighting side of our industry, the President placed emphasis upon the gaining of ground by electricity, at the same time directing attention to the available weapon in our hands of gas, inexpensive to the consumer, and of the modern devices for the convenient lighting of gas.

Your Committee would urge the necessity for a careful consideration of this feature, and the sore need in this field for the study of illumination or proper distribution of gas-light. To this feature, in the artificial gas field, much thought and study is being given, and we would direct attention to the special designs of chandeliers and fixtures made by several of the chandelier concerns that place gas as a means of ornamental illumination in the fore front.

In closing our report, we desire to compliment the President upon his practical, comprehensive and timely address, and urge upon our members present and absent an equal degree of careful consideration of the excellent suggestions presented.

Respectfully submitted,

LUCIUS S. BIGELOW,
S. S. ALLEN, JR.,
K. M. MITCHELL,
Committee.

On motion of Mr. M. M. Sweetman, duly seconded, the report of the committee was adopted and placed on file.

President McKenzie then resumed the Chair, and announced that the next order of business was the election of officers. Whereupon, Mr. John F. Parker, of the Committee on Nominations, read the following report:

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REPORT OF COMMITTEE ON NOMINATIONS.

MR. PRESIDENT AND GENTLEMEN: Your committee beg leave to submit the following named gentlemen to serve this Association as Officers and Directors for the coming year:

President. — John Mesmore Garard, of Columbus, Ohio.

Vice-President. — Alexander Barksdale Macbeth, Independence, Kansas.

Secretary and Treasurer. — Thomas Clive Jones, Delaware, Ohio.

Western Director. — Michael M. Sweetman, Kansas City, Missouri.

Eastern Director. — William H. Hammon, Pittsburg, Pennsylvania.

KERR M. MITCHELL,
M. W. WALSH,
JOHN F. PARKER,
Committee.

ELECTION OF OFFICERS.

It was moved by Mr. Kerr M. Mitchell, and regularly seconded, that the report of the committee be adopted. The motion was regularly put and carried, and the Officers and Directors named in the report of the committee declared elected.

SOME RESPONSES.

Thereupon, at the request of the retiring President, President-elect Garard took the Chair, being greeted with tumultuous applause. When the latter was at an end President Garard said: I wish you all knew just how much I thank you and how much I appreciate it, for I cannot tell it to you; it is out of the question. The honor of being at the head of such a body of men as this is one of which any man might be proud. Gentlemen, again I thank you. [Applause.]

Secretary-Treasurer Jones, having been called upon, said:

GENTLEMEN: I certainly appreciate the honor of being elected your Secretary and Treasurer; but as the efficient duties

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of the Secretary and Treasurer depend entirely upon the co-operation of the members, I again ask for that co-operation during next year that you so freely accorded me last year. [Applause.]

Mr. M. M. Sweetman was then called for, and said:

MR. PRESIDENT AND GENTLEMEN: I appreciate the honor of being elected a Director in what I think is the greatest Association in this country. [Applause.]

In response to numerous calls, Mr. W. H. Hammon said:

GENTLEMEN: I hope mine will take a more substantial form when you come to Pittsburg. [Applause.]

REMUNERATING THE SECRETARY-TREASURER.

MR. J. M. GARARD: I would like to offer a motion that the salary of our Secretary and Treasurer be increased. (Seconded by Mr. K. M. Mitchell).

MR. J. M. GARARD: Just a moment; maybe you won't. While I don't mean to say that I am better able to judge, I was in a position to know more about the work performed by Mr. Jones than anyone else, because he annoyed me like thunder, running after me about this thing and the other. I want to pay him enough so he can do that himself or else divide the salary with me; so I suggest, and I make it as a motion, that we make Mr. Jones' salary for the coming year $750 instead of $500. (Seconded and adopted).

SECRETARY JONES: I certainly greatly appreciate the compliment, and money, too, of course, is something that everybody can use.

President Garard then called for the report of the Committee on Final Resolutions, and Mr. L. S. Bigelow, as Chairman of that Committee, read the same, as follows:

REPORT OF COMMITTEE ON FINAL RESOLUTIONS.

Your Committee desires to report as follows:

First. — That the sincere thanks of this body be extended to His Honor Mayor Henry M. Scales, and the Honorable Den-

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nis T. Flynn — first, for the hearty welcome extended to this Association by His Honor, the Mayor, and for the Golden Key to this wall-less city that has received us with open arms, and to the former representative in Congress from the Territory (now State) of Oklahoma, for the data given the Association and other matters of exceptional interest also embraced in his address upon the second morning of our convention.

To the members of the Entertainment Committee, there should be expressed the warmest possible evidence of appreciation for their unremitting energy and their achievements in behalf of the Association and its members. Especial thanks should be rendered to Mr. M. W. Walsh, Chairman of this Committee, who has borne the heat and burden of this work.

Second. — To the Chamber of Commerce of Oklahoma City, we recommend an expression of appreciation in view of the activity and aid manifest by that body in behalf of this Association.

Third. — To the Oklahoma Gas & Electric Company, to The Oklahoma Gas Company and connections, we urge an expression of appreciation commensurate with the liberality manifest by these companies in providing for our Association entertainment of a most royal nature.

Fourth. — We would direct attention to the debt of gratitude which this Association should express to the manufacturers whose presence with their exhibits have made possible a practical demonstration of the advances made in the art of the utilizing of gas.

Fifth. — We deem it a pleasure to recall to the memory of the Association the fact that Mr. M. W. Walsh and Mr. H. C. Nilson were the two members of this organization to bring to it an invitation to make Oklahoma City an abiding place for one of the Association gatherings, they having presented this invitation as far back as the Joplin meeting, seconded by an invitation from His Honor the Mayor.

Sixth. — To the proprietors of the Lee-Huckins Hotel, we would recommend an expression of appreciation for the cour-

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teous attention, the meeting-facilities placed at our disposal, voicing our recognition of unabated care and thoughtfulness.

Respectfully submitted,

L. S. BIGELOW,
ALAN LEAMY,
C. W. SEARS,
Committee.

MR. L. S. BIGELOW: I would direct attention to the fact that the President is not mentioned in this report. There should be an especial and separate vote extended to the President for his able work during the past year instead of embracing it in a general report.

MR. F. W. STONE: I move the adoption of the report, with the suggestion that has been made for its amendment, or addition to it.

The motion was put and unanimously carried.

MR. M. M. SWEETMAN: I understand that the President was left out of that report. Therefore, I move you that a special vote of thanks be tendered our retiring President for his official favors during the last year.

PRESIDENT GARARD: You have heard the motion. All in favor please rise to their feet. They seem to think you have done all right, Mr. McKenzie. The motion is carried, unanimously.

The business of the meeting having been completed, on motion, duly seconded, the Fifth Annual Meeting of The Natural Gas Association of America then adjourned *sine die*.

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APPENDIX

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OFFICERS

OF THE

NATURAL GAS ASSOCIATION OF AMERICA 1910-1911

President.

JOHN MESMORE GARARD.....Columbus, Ohio

Vice--President.

ALEXANDER BARKSDALE MACBETH.....Independence, Kansas

Secretary and Treasurer.

THOMAS CLIVE JONES.....Delaware, Ohio

Directors.

KERR M. MITCHELL, St. Joseph, Missouri..Term Expires 1911
PRESTON W. LUPHER, Columbus, Ohio.....Term Expires 1911
MICHAEL M. SWEETMAN, Kansas City, Mo..Term Expires 1912
WILLIAM H. HAMMON, Pittsburgh, Pa.....Term Expires 1912

Wrinkle Department.

FREDERICK W. STONE, *Editor*.....Ashtabula, Ohio

Past Presidents.

KERR MURRAY MITCHELL.....1906-1907
JESSE CLARK MCDOWELL.....1908-1909
WILLIAM HUNTER MCKENZIE.....1910

Past Secretaries.

JOSEPH H. DUNKEL.....1906-1908
JAMES F. OWENS, Elected for.....1909

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DIRECTORY OF MEMBERSHIP

(The date with each name is that of election to membership.)

HONORARY MEMBERS.

Bailey, Edgar Henry Summerfield.....May 19, 1908
Professor of Chemistry, University of Kansas, 1329 Ohio Street, Lawrence, Kansas.

Bownocker, John Adams.....May 18, 1909
State Geologist of Ohio, Ohio State University, Columbus, Ohio.

Gould, Charles Newton.....May 17, 1910
Director, Oklahoma Geological Survey, Norman, Oklahoma.

Harmon, Judson.....May 18, 1909
Governor of Ohio, State House, Columbus, Ohio.

Haworth, Erasmus.....May 21, 1907
Professor of Geology, University of Kansas, Lawrence, Kansas.

ACTIVE MEMBERS.

Abbott, E. D......May 18, 1909
Superintendent Springfield Gas Company, 78 West Main Street, Springfield, Ohio.

Adams, William M......May 18, 1909
Manager, Citizens Gas & Electric Company, Elyria, Ohio.

Alberty, P. A......May 18, 1909
Secretary to the General Manager, Logan Natural Gas & Fuel Company, 34 Ruggery Building, Columbus, Ohio.

Allen, J. F......May 18, 1909
P. O. Box 1208, Bartlesville, Oklahoma.

Allen, S. S. Jr......May 21, 1907
Assistant Secretary, Columbus Gas & Fuel Company, 135 North Front Street, Columbus, Ohio.

Almirt, H......May 21, 1907
General Manager, Wichita Gas & Electric Company, Wichita, Kansas.

Anderson, H. M......May 18, 1909
Superintendent, The Logan Natural Gas & Fuel Company, 912 North Columbus Street, Lancaster, Ohio.

Ardis, J. B......May 17, 1910
President, Louisiana Gas Company, Texas Street, Shreveport, Louisiana.

Armbuster, George E......May 18, 1909
General Gas Inspector, Logan Natural Gas & Fuel Company, 123 Clinton Court, Findlay, Ohio.

Armstrong, A. A......May 19, 1908
Purchasing Agent, Union National Gas Corporation, 1001 Farmers Bank Building, Pittsburg, Pennsylvania.

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Ault, S. A. .....May 19, 1908
Salesman, Hoffman Water Heater Company, 407 Washington Street, Lorain, Ohio.

Ayers, Chester T. .....May 21, 1907
Secretary, Union Carbide Sales Company, 79 Wall Street, New York, New York.

Babbitt, Steward .....May 18, 1909
Sales Manager, Gas Engine Department, Snow Steam Pump Works, 525 Norwood Avenue, Buffalo, New York.

Baker, E. L. .....May 21, 1907
Agent, Kansas Natural Gas Company, Joplin, Missouri.

Ballard, Charles R. .....May 18, 1909
Chief Engineer, Manfacturers Light & Heat Company, 307 Columbia Bank Building, Pittsburg, Pennsylvania.

Ballin, A. E. .....May 18, 1909
Assistant Chief Engineer, Snow Steam Pump Works, Snow and Roberts Avenue, Buffalo, New York.

Barnes, Frank .....May 19, 1908
Secretary and Treasurer, Bristow Gas Company, Bristow, Oklahoma.

Barnes, George W. .....June 12, 1906
Representative, Equitable Meter Company, 112 Gotham Street, Pittsburg, Pennsylvania.

Barnsdall, Theodore N. .....May 18, 1909
President, Union Natural Gas Corporation, Farmers Bank Building, Pittsburg, Pennsylvania.

Barr, S. H. ..... May 21, 1907
Assistant Treasurer, Caney Gas Company, Caney, Kansas.

Barrows, George .....February 27, 1906
United Gas Improvement Company, Broad and Arch Streets, Philadelphia, Pennsylvania.

Bartley, E. L. .....May 18, 1909
General Superintendent, Retail Department, American Natural Gas Company, 407 Park Building, Pittsburg, Pennsylvania.

Beach, E. C. .....May 17, 1910
Manager, Pulaski Gas-Light Company, 210 Main Street, Little Rock, Arkansas.

Beardslee, C. H. .....May 18, 1909
President, The Cleveland Gas, Light & Coke Company, 421 Superior Avenue, E. Cleveland, Ohio.

Bell, Charles D. .....May 21, 1907
President and Manager, The Parsons Natural Gas Company, 1304 Corning Avenue, Parsons, Kansas.

Bendit, Louis .....June 12, 1906
Kansas City, Sales Manager, Buckeye Engine Company, 504 New York Life Building, Kansas City, Missouri.

Benedict, W. P. .....May 19, 1908
Superintendent, Kansas Natural Gas Company, Joplin, Missouri.

Biddison, P. McDonald .....May 21, 1907
Mechanical Engineer, Columbia Gas & Electric Company, Huntington, West Virginia.

Bigelow, Lucius Seymour .....May 21, 1907
President, Natural Gas Journal, Williamantic, Connecticut.

Billimek, H. B. .....February 27, 1906
Atchison Railway, Light & Power Company, Atchison, Kansas.

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Bishop, H. W. Jr. .....May 18, 1909
Superintendent, Lone Star Gas Company, Fort Worth, Texas.

Bishop, Max Miller .....May 17, 1910
Inspector, Lone Star Gas Company, 1st National Bank Building, Ft. Worth, Texas.

Bixby, W. A. .....May 21, 1907
General Manager, Springfield Gas & Electric Company, and Springfield Traction Company, 327 St. Louis Street, Springfield, Missouri.

Blye, John H. .....May 18, 1909
Secretary and Treasurer, Standard Meter Company; 3112 North Seventeenth Street, Philadelphia, Pennsylvania.

Bodine, Samuel T. .....May 17, 1910
Vice President, United Gas Improvement Company, Broad & Arch Streets, Philadelphia, Pennsylvania.

Booth, Arthur .....May 17, 1910
Assistant General Purchasing Agent, Philadelphia Company, 435 Sixth Avenue, Pittsburg, Pennsylvania.

Boothe, George P. .....May 19, 1908
S. R. Dresser Mfg. Company, Bradford, Pennsylvania.

Braden, Glenn T. .....May 17, 1910
President, Oklahoma Natural Gas Company, 811 Farmers Bank Building, Pittsburg, Pennsylvania.

Brake, J. A. .....May 17, 1910
Superintendent Ft. Smith Light & Traction Company, 6th and "A", Ft. Smith, Arkansas.

Branch, Harry .....May 18, 1909
Manager, Kansas City Department, Westinghouse Machine Company, 407 New England Building, Kansas City, Missouri.

Brawley, Hugh P. .....May 19, 1908
Superintendent Right-of-Way Claims, Kansas Natural Gas Company, Independence, Kansas.

Brink, George R. .....May 18, 1909
Assistant Treasurer, Union Natural Gas Corporation, Farmers Bank Building, Pittsburg, Pennsylvania.

Broder, W. J. .....May 18, 1909
Superintendent Distributing Division, Logan Natural Gas & Fuel Company, 34 Ruggery Building, Columbus, Ohio.

Brown, D. J. .....May 18, 1909
Assistant Manager, Oil Well Supply Company, 215 Water Street, Pittsburg, Pennsylvania.

Brown, Sealy L. .....May 19, 1908
Inspector, Montgomery County, Coffeyville, Kansas.

Bruen, George H. .....May 21, 1907
General Manager, Webb City-Cartersville Gas Company, Webb Street, Webb City, Missouri.

Brummett, J. R. .....May 17, 1910
Claim Agent, Lone Star Gas Company, Henrietta, Texas.

Brundrett, Ernest L. .....May 21, 1907
General Auditor, United Gas Improvement Company, 100 North Broad Street, Philadelphia, Pennsylvania.

Bullock, C. L. .....February 27, 1906
General Superintendent, Kansas Natural Gas Company, Joplin, Missouri.

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Byrnes, P. V. .....May 17, 1910
Vice President and Manager, Ontario Pipe Line Company, Limited, 72 James Street North, Hamilton, Ontario, Canada.

Cannon, R. B. .....May 19, 1908
Samson Light Company, 904 East 12th Street, Kansas City, Missouri.

Cantrell, C. C. .....May 17, 1910
Secretary and Manager, Central Light & Fuel Company, 15 East Hobson Avenue, Sapulpa, Oklahoma.

Carey, Joseph .....May 19, 1908
President and General Manager, Garnett Light & Fuel Company, Garnett, Kansas.

Carmody, M. B. .....May 18, 1909
Superintendent, Caddo Gas & Oil Company, Shreveport, Louisiana.

Carruthers, John .....May 18, 1909
President, Bessemer Gas Engine Company, Grove City, Pennsylvania.

Carter, J. H. .....May 19, 1908
Superintendent, Gas Department, Home Light, Heat & Power Company, 512 North Broadway, Pittsburg, Kansas.

Champion, E. C. .....May 19, 1908
Superintendent, Kansas Portland Cement Company, Iola, Kansas.

Chase, Frank L. May 18, 1909
President, Central Contract & Finance Company, 821 Columbus Savings & Trust Building, Columbus, Ohio.

Church, C. B. .....May 19, 1908
Sperintendent, Kansas Natural Gas Company, Chanute, Kansas.

Clapp, G. N. .....May 18, 1909
Secretary, Treasurer and General Manager, Middletown Gas & Electric Company, 235 South Main Street, Middletown, Ohio.

Clark, Walton .....May 21, 1907
Third Vice President, United Gas Improvement Company, Broad & Arch Streets, Philadelphia, Pennsylvania.

Cody, A. S. .....May 17, 1910
Sales Manager, United Gas Light & Mfg. Company, 380 Third Avenue, New York, New York.

Cole, T. F. .....May 17, 1910
Manager, Home Light, Heat & Power Company, 512 N. Building, Pittsburg, Kansas.

Connolly, J. S. .....June 12, 1906
General Manager, Carthage Gas Company, Carthage, Missouri.

Corcoran, W. F. .....May 21, 1907
Contractor James G. Corcoran Company, House Building, Pittsburg, Pennsylvania.

Coughlin, D. M. .....May 21, 1907
Sales Department, St. Joseph Gas Company, St. Joseph, Missouri.

Coyle, F. J. .....March 20, 1906
Division Superintendent, Kansas Natural Gas Company, 4014 Terrace, S. W. Kansas City, Missouri.

Coyle, Henry .....May 18, 1909
General Superintendent, Logan Natural Gas & Fuel Company, 34 Ruggery Building, Columbus, Ohio.

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Cozzins, L. E. .....May 21, 1907
Superintendent, Caney River Gas Company, Claremore, Oklahoma.

Crahan, B. J. .....May 17, 1910
Superintendent, Joplin Gas Company, 110 Byers Avenue, Joplin, Missouri.

Craig, C. B. .....May 19, 1908
Manager, Bessemer Gas Engine Company, 119 East Fourth Street, Joplin, Missouri.

Crawford, Fred W. .....May 18, 1909
Vice President, Ohio Fuel Supply Company, 52 West Gay Street, Columbus, Ohio.

Crawford, George W. .....May 17, 1910
President, Ohio Fuel Supply Company, 2017 Farmers Bank Building, Pittsburg, Pennsylvania.

Cunningham, J. C. .....May 18, 1909
General Superintendent, West Virginia Central Gas Company, 113 Davis Avenue, Elkins, West Virginia.

Curran, G. W. .....May 17, 1910
Comptroller, Syracuse Lighting Company, Broad & Arch Streets, Philadelphia, Pennsylvania.

Curtis, A. G. .....May 19, 1908
General Manager, Shreveport Gas, Electric Light & Power Company, 116 Texas Street, Shreveport, Louisiana.

Custer, Z. B. .....May 19, 1908
Manager, Custer Coupling Company, Bradford, Pennsylvania.

Dague, A. B. C. .....June 12, 1906
Manager, Bonner Springs Gas Company, Bonner Springs, Kansas.

Dallior, J. C. .....May 18, 1909
Representative The National Supply Company, Lancaster, Ohio.

Daily, A. B. Jr. .....May 18, 1909
General Superintendent of Field & Supply, Manufacturers Light & Heat Company, 310 Columbia Bank Building, Pennsylvania.

Daly, Martin B. .....May 18, 1909
President and Manager, The East Ohio Gas Company, 1447 East Sixth Street, Cleveland, Ohio.

Dana, J. W. .....May 17, 1910
Counsel, The Wyandotte County Gas Company, Husted Building, Kansas City, Kansas.

Davis, H. R. .....May 21, 1907
Secretary to the General Manager, Kansas Natural Gas Company, Independence, Kansas.

Dawes, B. G. .....May 17, 1910
President, Vivian (Louisiana) Oil Company, Marietta, Ohio.

Dawes, Henry M. .....May 17, 1910
President, Pulaski Gas Light Company, Little Rock Arkansas, 171 La Salle Street, Chicago, Illinois.

Deemer, F. C. .....May 18, 1909
Gas and Oil Operator, 123 Jefferson Street, Brookville, Pennsylvania.

Diamond, J. H. .....May 18, 1909
General Manager, The Diamond Hardware Company, 217 Diamond Street, Pittsburg, Pennsylvania.

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Dibbens, W. J. .....May 19, 1908
General Manager, Guthrie Gas Company, 213 East Oklahoma Avenue, Guthrie, Oklahoma.

Diescher, Alfred J. .....May 18, 1909
Engineer, Hope Engineering and Supply Company, 803 Farmers Bank Building, Pittsburg, Pennsylvania.

Dings, P. C. .....May 17, 1910
General Manager, Ardmore Gas Company, Ardmore, Oklahoma.

Dittman, C. E. .....May 17, 1910
Manager, Waynesburg Home Gas Company, Waynesburg, Pennsylvania.

Dixon, Philip .....May 18, 1909
Superintendent, St. Marys Gas Company, St. Marys, Ohio.

Dods, John C. .....May 18, 1909
Engineer & Superintendent, Edgar Zinc Company of St. Louis, 346 West First Street, Cherryville, Kansas.

Doherty, Henry L. .....March 20, 1906
President, Denver (Col.) Gas & Electric Company, 60 Wall Street, New York, New York.

Dolan, Thomas .....May 17, 1910
President, The United Gas Improvement Company, Broad & Arch Streets, Philadelphia, Pennsylvania.

Donehue, D. M. .....May 18, 1909
Oil & Gas Securities, 812 Columbia Bank Building, Pittsburg, Pennsylvania.

Douglass, S. M. .....May 18, 1909
General Counsel, Logan Natural Gas & Fuel Company, 22½ South Park Street, Mansfield, Ohio.

Douthirt, W. F. .....May 21, 1907
Secretary, United Gas Improvement Company, Broad & Arch Streets, Philadelphia, Pennsylvania.

Duke, Joseph .....May 18, 1909
Accountant, Newark Natural Gas & Fuel Company, Newark, Ohio.

Duncan, Alva .....June 12, 1906
Shreveport, Louisiana.

Dunkel, Joseph H. .....February 27, 1906
General Manager, Citizens' Light, Heat & Power Company, 5 East Henry Street, Lawrence, Kansas.

Dunlap, W. C. .....May 18, 1909
Agent, Logan Natural Gas & Fuel Company, 26 West Main Street, Chillicothe, Ohio.

Eakin, R. E. .....May 19, 1908
Auditing Department, Kansas Natural Gas Company, Independence, Kansas.

Eibenschutz, S. .....May 19, 1908
Pittsburg, Pennsylvania.

Emington, P. J. .....May 21, 1907
District Superintendent, Kansas Natural Gas Company, Columbus, Kansas.

Enslow, F. B. .....May 18, 1909
Vice President, The Columbia Gas & Electric Company, Huntington, West Virginia.

Ernst, J. C. .....May 18, 1909
Vice President, The Columbia Gas & Electric Company, South Covington Street Railway Company, Covington, Kentucky.

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Ewing, Frederick ..... May 18, 1909
Attorney and Lease Superintendent, The Columbus Natural Gas Company, 74 Granville Street, Newark, Ohio.

Farrington, Frank W. ..... February 27, 1906
Superintendent, Industrial Department, Union Gas & Electric Company, 3017 Jefferson Avenue, Cincinnati, Ohio.

Finney, Frank F. ..... May 17, 1910
Superintendent of Gas Lines, Indian Territory Illuminating Oil Company, Bartlesville, Oklahoma.

Fischer, George J. ..... May 21, 1907
Modern Iron Works, Quincy, Illinois.

Fisher, Dawson ..... May 19, 1908
Producer, Chanute, Kansas.

Fisher, F. P. ..... May 21, 1907
Mechanical Engineer, Philadelphia Company, 435 Sixth Avenue, Pittsburg, Pennsylvania.

Foshay, W. B. ..... May 17, 1910
Assistant Treasurer, Secretary and Manager, United Gas Company, South Main Street, Wichita, Kansas.

Fowks, William ..... June 12, 1906
Inspector, Kansas Natural Gas Company, Joplin, Missouri.

Frankel, J. ..... May 19, 1908
Manager, Block Light Company, 136 Lake Street, Chicago, Illinois.

Friedenberg, D. ..... May 18, 1909
Auditor, Union Natural Gas Corporation, 34 Ruggery Building, Columbus, Ohio.

Fritz, R. O. ..... May 21, 1907
Manager, Bunting Stone Company, 804 Walnut Street, Kansas City, Missouri.

Fuiton, J. L. ..... May 18, 1909
Secretary and Treasurer, The Citizens Gas & Oil Manufacturing Company, Portland, Indiana.

Gage, W. P. ..... May 17, 1910
Vice President, Lone Star Gas Company, 1st National Bank Building, Fort Worth, Texas.

Galbraith, George W. ..... May 18, 1909
Sales Manager, Snow Steam Pump Works, 211 West Fourth Street, Cincinnati, Ohio.

Garard, John M. ..... May 18, 1909
Second Vice President and General Manager, Ohio Fuel Supply Company, 52 West Gay Street, Columbus, Ohio.

Gassett, A. L. ..... May 19, 1908
Secretary, Economy Stove Company, Cleveland, Ohio.

Gates, E. C. ..... May 19, 1908
Attorney, Fort Scott, Kansas.

Gavin, Thomas ..... May 21, 1907
Producer, Independence, Kansas.

Gibson, C. A. ..... May 19, 1908
Kansas Natural Gas Company, Independence, Kansas.

Gibson, W. C. ..... May 17, 1910
Manager, North Texas Gas Company, 613 Ohio Avenue, Wichita Falls, Texas.

Gill, W. C. ..... May 18, 1909
Representative, Welsbach Street Lighting Company of America, Gibson House, Cincinnati, Ohio.

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Gillespie, E. A. .....May 19, 1908
Foreman, Blackwell Oil Company, 611 North Main Street, Blackwell, Oklahoma.

Gillmore, F. M. .....May 21, 1907
Manager and Secretary, Mound Valley Gas Company, Mound Valley, Kansas.

Goff, George S. .....May 17, 1910
General Manager, Crystal Gas Company, 16 West Market Street, Corning, New York.

Goodrich, H. B. .....May 17, 1910
Manager Fuel Oil Properties, Gulf Colorado & Santa Fe Ry. Company, Ardmore, Oklahoma.

Grear, W. S. .....May 19, 1908
Welsbach Company, Peoples Gas Building, Chicago, Illinois.

Green, David .....May 21, 1907
Auditor, Kansas Natural Gas Company, Independence, Kansas.

Greenert, John A. .....May 21, 1907
Superintendent, Hutchinson Gas & Fuel Company, 14 East Sherman Street, Hutchinson, Kansas.

Groves, George F. .....May 18, 1909
135 Congress Street, Bradford, Pennsylvania.

Guillan, R. J. .....May 19, 1908
Auditor, Kansas Natural Gas Company, Independence, Kansas.

Gunn, Rice .....May 21, 1907
Manager, Gunn Pipe Line Company, Ft. Scott, Kansas.

Gunn, W. A. .....May 21, 1907
President, Gunn Pipe Line Company, Ft. Scott, Kansas.

Gurnsey, W. M. .....May 18, 1909
Agent, Crystal Gas Company, 16 West Market Street, Corning, New York.

Gwynn, E. F. .....May 18, 1909
President, Gwynn Gas Burner & Engineering Company, 708 Empire Building, Pittsburg, Pennsylvania.

Hadley, W. R. .....May 19, 1908
Secretary and Treasurer, Union Natural Gas Corporation, 1010 Farmers Bank Building, Pittsburg, Pennsylvania.

Haines, Jansen .....May 19, 1908
Manager, Des Moines Gas Company, Des Moines, Iowa.

Hammack, Charles E. .....May 18, 1909
Chief Inspector, The Logan Natural Gas & Fuel Company, 34 Ruggery Building, Columbus, Ohio.

Hammon, William H. .....June 12, 1906
President, The Hammon Coupler Company, 803 Farmers Bank Building, Pittsburg, Pennsylvania.

Hampton, Wade Jr. .....May 17, 1910
Superintendent, Clayco Oil & Pipe Line Company, Bowie, Texas.

Hare, C. Willing .....May 17, 1910
Manager, New Business Department, The United Gas Improvement Company, Broad & Arch Streets, Philadelphia, Pennsylvania.

Harley, J. M. .....May 18, 1909
Field Manager, Leamington Oil Company, 727 Majestic, Detroit, Michigan.

Hartzell, A. C. .....May 19, 1908
Treasurer, Greenville Natural Gas Company, Greenville, Pennsylvania.

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Hasting, D. ..... May 17, 1910
General Manager, Oklahoma Natural Gas Company, 1021 Cincinnati Street, Tulsa, Oklahoma.

Hay, Ralph W. ..... May 18, 1909
Assistant General Superintendent, The Wheeling Natural Gas Company, 310 Columbia Bank Building, Pittsburg, Pennsylvania.

Hays, Victor A. ..... May 21, 1907
General Auditor, Kansas Natural Gas Company, 817 Farmers Bank Building, Pittsburg, Pennsylvania.

Heard, George ..... May 18, 1909
President, The Natural Gas Company of West Virginia, 323 Fourth Avenue, Pittsburg, Pennsylvania.

Heath, C. R. ..... May 19, 1908
President, Noblesville Gas & Improvement Company, Noblesville, Indiana.

Henry, W. C. Jr. ..... June 12, 1906
Independence, Kansas.

Higgins, F. W. ..... May 19, 1908
Samson Light Company, Kansas City, Missouri.

Higgins, Robert H. ..... May 18, 1909
Superintendent, The Marion Gas Company, 215 East Center Street, Marion, Ohio.

Hilderbrand, H. D. ..... May 19, 1908
Hall Steam Pump Works, Pittsburg, Pennsylvania.

Hinshaw, E. M. ..... May 17, 1910
Owner of Controlling Interest, Olney Gas Company, Summer Gas Company, Illinois, 1654 College Avenue, Indianapolis, Indiana.

Hitchcock, Otto G. ..... May 18, 1909
Secretary and General Manager, Hays Manufacturing Company, 12th and Liberty Streets, Erie, Pennsylvania.

Hoagland, H. C. ..... May 17, 1910
Manager, Muskogee, Gas & Electric Company, Muskogee, Oklahoma.

Hoffman, R. J. ..... May 19, 1908
Manager, Hoffman Meter Company, Bradford, Pennsylvania.

Holbrook, David Oliver ..... May 19, 1908
Vice President, The Dayton Pipe Coupling Company, 2348 Oliver Building, Pittsburg, Pennsylvania.

Holmes, A. G. ..... June 12, 1906
Secretary and Manager, Pittsburg Meter Company, Braddock and Cable Avenues, East Pittsburg, Pennsylvania.

Horton, F. J. ..... May 19, 1908
General Manager, Portland Gas & Pipe Line Company, Iola, Kansas.

Hottinger, R. L. ..... May 18, 1909
Meter Repair, Logan Natural Gas & Fuel Company, Fremont, Ohio.

Howe, Albert ..... May 18, 1909
Agent, The Fremont Gas, Electric Light & Power Company, North Front Street, Fremont, Ohio.

Hoyt, H. J. ..... May 18, 1909
Representative, Metric Metal Works, 2001 Farmers Bank Building, Pittsburg, Pennsylvania.

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Hoyte, Walter S. .....May 21, 1907
First Vice President and Treasurer, Wichita Natural Gas Company, 127 South Main Street, Wichita, Kansas.

Hudson, A. .....May 19, 1908
Owner, Ochelata Gas Company, Ochelata, Oklahoma.

Hunter, S. S. .....May 17, 1910
Manager, Caddo Gas & Oil Company, Shreveport, Louisiana.

Hunter, W. T. .....May 18, 1909
Secretary and Treasurer, The Columbia Gas & Electric Company, First National Bank Building, Cincinnati, Ohio.

Hurley, W. J. .....May 19, 1908
General Inspector, Kansas Natural Gas Company, Independence, Kansas.

Hutton, James M. .....May 18, 1909
Director, The Columbia Gas & Electric Company, First National Bank Building, Cincinnati, Ohio.

James, C. S. .....May 188, 1909
Secretary and Treasurer, Kansas Natural Gas Company, 826 Farmers Bank Building, Pittsburg, Pennsylvania.

James, R. C. .....May 17, 1910
Assistant General Auditor, The United Gas Improvement Company, Broad & Arch Streets, Philadelphia, Pennsylvania.

Jarvis, T. B. .....May 19, 1908
Secretary, Jarvis Gas Burner, Heating & Plumbing Company, 4022 Bellview Avenue, Kansas City, Missouri.

Johnson, Paul R. .....May 19, 1908
Superintendent, Sagamon Oil & Gas Company, Bartlesville, Oklahoma.

Jones, Thomas Clive .....June 12, 1906
President, Delaware Gas Company, 6 West Winter Street, Delaware, Ohio.

Jones, W. H. .....June 12, 1906
Manager, Western Distributing Company, Halstead, Kansas.

Jones, W. L. .....May 21, 1907
Traveling Salesman, Bailey-Reynolds Gas Fixture Company, 1208 Main Street, Kansas City, Missouri.

Jurgensen, Hans Carl .....May 19, 1908
712 Central Avenue, Kansas City, Missouri.

Keating, W. J. .....May 19, 1908
General Inspector, Kansas Natural Gas Company, Independence, Kansas.

Kellogg, E. B. .....May 18, 1909
Superintendent, Ontario Gas Company, Homeoy Falls, New York.

Kellum, Benj. J. .....June 12, 1906
Manager, Western Department, Welsbach Company, 70 Wabash Avenue, Chicago, Illinois.

Kelly, Henry E. .....May 21, 1907
President, Mansfield Gas Company, 617 Garrison Avenue, Fort Smith, Arkansas.

Kelly, M. C. .....May 21, 1907
General Manager, Home Light, Heat & Power Company, Pittsburg, Kansas.

Kerr, J. A. .....June 12, 1906
Traveling Salesman, Reineke-Wilson Company, Kansas City, Missouri.

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Kidner, R. L. .....March 20, 1906
Manager, Reineke-Wilson Company, 1223 West Tenth Street, Kansas City, Missouri.

Kier, Thomas M. .....May 18, 1909
Superintendent, Columbus Natural Gas Company, Granville, Ohio.

King, I. W. .....May 19, 1908
Manager, Ottawa Gas & Electric Company, Ottawa, Kansas.

Kirkwood, Murray .....June 12, 1906
Traveling Salesman, H. Mueller Mfg. Company, Decatur, Illinois.

Klumpp, John Bartleman .....May 19, 1908
Inspecting Engineer, United Gas Improvement Company, Broad & Arch Streets, Philadelphia, Pennsylvania.

Knight, J. J. .....May 18, 1909
Vice President, Kalamazoo Gas Company, Kalamazoo, Michigan.

Knight, W. H. .....May 19, 1908
General Manager, Cleveland Gas Meter Company, 2180 East 65th Street, Cleveland, Ohio.

Kosson, James .....May 18, 1909
Foreman, The Columbus Gas & Fuel Company, 550 Mt. Vernon Avenue, Columbus, Ohio.

Krick, Kay C. .....February 27, 1906
Special Agent, The Logan Natural Gas & Fuel Company, 34 Ruggery Building, Columbus, Ohio.

Labrunerie, F. .....May 21, 1907
Treasurer, St. Joseph Gas Company, 8th & Francis Streets, St. Joseph, Missouri.

LaCroix, A. .....May 18, 1909
Superintendent of Field, The Columbus Gas & Fuel Company, 335 East Main Street, Lancaster, Ohio.

LaDow, B. E. .....May 19, 1908
Manager, Fredonia Gas Company, Fredonia, Kansas.

LaDow, C. V. .....May 17, 1910
Manager, The Fredonia Gas Company, Fredonia, Kansas.

Lambert, E. J. .....May 17, 1910
Treasurer, Midway Oil & Gas Company, Independence, Kansas.

Lambing, J. A. .....May 18, 1909
The Columbia Gas & Electric Company, Huntington, West Virginia.

Landon, J. M. .....May 21, 1907
Assistant General Manager, Kansas Natural Gas Company, Independence, Kansas.

Larkin, W. H. .....May 18, 1909
Manager, Larkin & Company, Butler, Pennsylvania.

Lathrop, Alanson P. .....May 17, 1910
President, American Light & Traction Company, 40 Wall Street, New York, New York.

Lawrence, J. F. .....May 19, 1908
Division Superintendent, Kansas Natural Gas Company, Garnett, Kansas.

Leamy, Alan .....May 18, 1909
Manager Middle West Department Welbach Company, 116 East Chestnut Street, Columbus, Ohio.

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Leanard, A. M. .....May 19, 1908
General Manager, Caney River Gas Company, Box 1017, Tulsa, Oklahoma.

Leber, George J. .....May 19, 1908
618 Caxton Building, Cleveland, Ohio.

LeFevre, Harry E. .....May 17, 1910
Superintendent, American Natural Gas Company, Middle Street, Sharpsburg, Pennsylvania.

Lemon, C. W. ..... May 17, 1910
Secretary, Vivian (Louisiana) Oil Company, Marietta, Ohio.

Leonard, M. .....May 19, 1908
Superintendent, Kansas Natural Gas Company, Chanute, Kansas.

Lillie, Lewis .....May 21, 1907
Fourth Vice President and Treasurer, The United Gas Improvement Company, 1401 Arch Street, Philadelphia, Pennsylvania.

Lindsay, Robert J. .....May 18, 1909
Accountant, The Hammon Coupler Company, 803 Farmers Bank Building, Pittsburg, Pennsylvania.

Litle, T. J., Jr. .....May 19, 1908
Engineer, Welsbach Company, Gloucester City, New Jersey.

Lloyd, Thomas E. C. .....March 20, 1906
Superintendent, Wyandotte County Gas Company, Kansas City, Kansas.

Lord, G. C. .....May 19, 1908
Contractor, Independence, Kansas.

Lord, R. S. .....May 18, 1909
Secretary and Treasurer, The Hammon Coupler Company, 803 Farmers Bank Building, Pittsburg, Pennsylvania.

Loveland, Elmer .....May 18, 1909
Foreman, Logan Natural Gas & Fuel Company, 511 Sandusky Avenue, Fremont, Ohio.

Lufkin, E. C. .....May 17, 1910
Manager, Natural Gas Department, The Texas Company, Fort Worth National Bank Building, Fort Worth, Texas.

Lupher, C. A. .....May 18, 1909
Shareholder, The Logan Natural Gas & Fuel Company, Lancaster, Ohio.

Lupher, M. S. .....May 18, 1909
Gas & Oil Operator, Junction City Ohio.

Lupher, Preston W. .....May 18, 1908
Vice President and General Manager, Logan Natural Gas & Fuel Company, 34 Ruggery Building, Columbus, Ohio.

Lynn, James T. .....May 21, 1907
President, National Gas, Electric Light & Power Company, 402 Union Trust Building, Detroit, Michigan.

Lyon, J. D. .....May 18, 1909
Cincinnati Representative, Westinghouse Machine Company, Traction Building, Cincinnati, Ohio.

Macbeth, Alexander B. .....May 21, 1907
General Manager, Kansas Natural Gas Company, Independence, Kansas.

Magee, F. A. .....May 18, 1908
Secretary, Manufacturers Natural Gas Company, 606 Bank of Hamilton Building, Hamilton, Ontario, Canada.

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Mahan, C. F. .....May 21, 1907
Manager, National Supply Company of Kansas, Independence, Kansas.

Malloy, T. C. .....June 12, 1906
Contracting Agent, Kansas Natural Gas Company, Joplin, Missouri.

Mann, John L. .....May 17, 1910
Gas & Oil Operator, Box 242, Billings, Montana.

Mason, Alphonso .....May 18, 1909
Representative, Welsbach Company, Gloucester City, New Jersey.

Mattocks, S. J. .....May 19, 1908
Vice President and Treasurer, United Gas Company, 403 R. A. Long Building, Kansas City, Missouri.

Maxon, J. H. .....May 18, 1909
Superintendent, Gas Department, Shreveport Gas, Electric Light & Power Company, Shreveport, Louisiana.

Mayers, J. Alex. .....May 21, 1907
Gas Engineer, 66 Pine Street, New York, New York.

McCloskey, James P. .....May 17, 1910
Assistant Superintendent, Columbia Gas & Electric Company, Huntington, West Virginia.

McCord, J. W. .....May 18, 1908
Secretary and General Manager, Clintonian Fuel & Oil Company, 511 Union National Bank Building, Columbus, Ohio.

McDowell, J. C. .....February 27, 1906
Gas Engineer, 1413 Farmers Bank Building, Pittsburg, Pennsylvania.

McIlhenny, John D. .....May 17, 1910
President, Gas Company of Montgomery County (Norristown, Pa.), 1339 Cherry Street, Philadelphia, Pennsylvania.

McIlvain, R. W. .....May 17, 1910
Charge of Land Department, Arkansas Natural Gas Company, 518 1st National Bank Building, Shreveport, Louisiana.

McKenzie, William H. .....February 27, 1906
Manager, Wyandotte County Gas Company, Sixth Avenue, Kansas City, Kansas.

McLane, O. J. .....May 21, 1907
Carthage Gas Company, Carthage, Missouri.

McLaughlin, H. .....June 12, 1906
Superintendent, Kansas Natural Gas Company, Galena, Kansas.

McMahon, J. W. .....May 18, 1909
General Manager, The North-Western Ohio Natural Gas Company, 520 Jefferson Avenue, Toledo, Ohio.

McMillin, Emerson .....May 17, 1910
Chairman, Board of Directors, American Light & Traction Company, 40 Wall Street, New York, New York.

McNaughten, J. N. .....May 18, 1909
Leasing Department, The Columbus Gas & Fuel Company, 135 North Front Street, Columbus, Ohio.

Mead, C. F. .....May 19, 1908
Attorney, Kansas City, Missouri.

Messenger, W. E. .....May 18, 1909
President, Messenger-Pringle Company, 23 Terminal Way, Pittsburg, Pennsylvania.

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Mettler, Lee B. .....June 12, 1906
Manager, Pittsburg Water Heater Company, 1406 Main Street, Kansas City, Missouri.

Metz, Eugene, Jr. .....June 12, 1906
Representative, Metric Metal Works, 113 West Eleventh Street, Kansas City, Missouri.

Mickley, M. A. .....May 18, 1909
Agent, The Marion Gas Company, 215 East Center Street, Marion, Ohio.

Miller, Fred A. .....May 19, 1908
General Manager, S. R. Dresser Mfg. Company, Bradford, Pennsylvania.

Miller, H. R. P. .....May 18, 1909
Agent, Ohio Fuel Supply Company, Croton, Ohio.

Miller, William A. .....May 18, 1909
General Manager, Gas Department, Union Gas & Electric Company, Fourth & Plum Streets, Cincinnati, Ohio.

Miner, Fred W. .....May 18, 1909
Agent, National Supply Company, 1001 Hartji Building, Pittsburg, Pennsylvania.

Mitchell, Kerr Murray .....February 27, 1906
General Manager, Saint Joseph Gas Company, Eighth and Francis Streets, Saint Joseph, Missouri.

Moeller, William, Jr. .....May 19, 1908
Engineer, "Mechanical," Kansas Natural Gas Company, Independence, Kansas.

Molloy, D. D. .....June 12, 1906
Manager, Oronogo Gas Company, Oronogo, Missouri.

Moore, A. H. .....May 18, 1909
Junior Member, Potter and Moore, 29 South Arch Street, Alliance, Ohio.

Morgan, Charles W. .....May 18, 1909
Superintendent, Logan Natural Gas & Fuel Company, Carlisle Place, Chillicothe, Ohio.

Morgan, Randal .....May 17, 1910
Vice President, The United Gas Improvement Company, Broad Arch Street, Philadelphia, Pennsylvania.

Morley, Robert L. .....June 12, 1906
Western Manager, Michigan Stove Works, 256 South Clinton Street, Chicago, Illinois.

Morris, H. C. .....May 17, 1910
Superintendent, Dallas Gas Company, Dallas, Texas.

Mueller, Fred B. .....June 12, 1906
Sales Manager, The H. Mueller Mfg. Company, Decatur, Illinois.

Munro, Robert .....June 12, 1906
Vice President, Reineke-Wilson Company, 41 Terminal Way, Pittsburg, Pennsylvania.

Murray, Alfred .....May 19, 1909
604 South Penn Avenue, Independence, Kansas.

Murtaugh, James .....May 18, 1909
Field Superintendent, Ohio Fuel Supply Company, 333 East Main Street, Lancaster, Ohio.

Neely, J. D. S. .....May 18, 1909
General Manager, Columbus Natural Gas Company, Lima, Ohio.

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Neely, F. M. .....May 17, 1910
General Superintendent, Wichita Natural Gas Company, 412 East Maple Street, Independence, Kansas.

Neely, Lemon H. .....May 18, 1909
Director, Wichita Natural Gas Company, St. Marys, Ohio.

Nicholson, N. H. .....May 17, 1910
Capitalists, 132 East 5th Street, Erie, Pennsylvania.

Nilson, Harry C. .....May 21, 1907
New Business Department, Oklahoma Gas & Electric Company, 110 North Broadway, Oklahoma City, Oklahoma.

Norris, Rollin .....May 21, 1907
Superintendent of Works, United Gas Improvement Company, Broad and Arch Streets, Philadelphia, Pennsylvania.

Northrup, J. D. .....May 17, 1910
General Superintendent, West Virginia & Maryland Gas Company, 9 South Centre Street, Cumberland, Maryland.

O'Donnell, J. E. .....June 12, 1906
Traveling Salesman, Michigan Stove Works, Chicago, Illinois.

O'Donnell, John L. .....May 19, 1908
United Fuel Gas Company, Ashland, Kentucky.

O'Neil, Charles .....May 21, 1907
Superintendent, Webb City-Cartersville Gas Company, Webb City, Missouri.

Osborn, J. C. .....May 19, 1908
510 Broadway, Kansas City, Missouri.

Ostermaier, William .....May 18, 1909
Traveling Auditor, Kansas Natural Gas Company, 910 Grand Avenue, Kansas City, Missouri.

Owens, James F. .....February 27, 1906
General Superintendent, Caney River Gas Company, 1112 Ash Street, Muskogee, Oklahoma.

Parker, John F. .....June 12, 1906
Sales Manager, Eclipse Gas Stove Company, South Main Street, Rockford, Illinois.

Patterson, William M. .....May 18, 1909
Salesman, Frick & Lindsay Company, 109 Wood Street, Pittsburg, Pennsylvania.

Pattison, C. H. .....February 27, 1906
President, Ottawa Gas & Electric Company, 403 Long Building, Kansas City, Missouri.

Pattison, W. L. .....February 27, 1906
Merriam, Kansas.

Patton, W. H. .....May 19, 1908
Superintendent, Coffeyville Gas & Fuel Company, Coffeyville, Kansas.

Perkins, B. W. .....May 18, 1909
Manager, Hartford City Gas Light Company, Hartford, Connecticut.

Posgate, James .....May 17, 1910
Mechanical Engineer, Kansas Natural Gas Company, Independence, Kansas.

Potter, L. R. .....May 18, 1909
Senior Member, Potter and Moore, 29 South Arch Street, Alliance, Ohio.

Pratt, J. W. .....May 17, 1910
Civil Engineer, 219 North Central Avenue, Chanute, Kansas.

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Price, P. I. .....May 17, 1910
Managing Director, The United Gas Companies Lt., 45 King Street, St. Catherines, Ontario, Canada.

Price, W. W. .....May 18, 1909
President, Dayton Pipe Coupling Company, Dayton, Ohio.

Pyzel, Dr. E. D. .....May 17, 1910
Gas Engineer, Heerengracht 141-145, Amsterdam, Holland.

Raber, H. W. .....May 21, 1907
Producer, Parsons, Kansas.

Ralston, William S. .....May 18, 1909
Engineer and Draughtsman, Chaplin-Fulton Mfg. Company, 34 Penn Street, Pittsburg, Pennsylvania.

Ransom, J. H. .....June 12, 1906
Manager, Prest Furnace Company, Kansas City Missouri.

Reeser, H. C. .....May 17, 1910
Secretary and Treasurer, The Ohio Fuel Supply Company, 2017 Farmers Bank Building, Pittsburg, Pennsylvania.

Renick, J. D. .....May 18, 1909
General Inspector, The Logan Natural Gas & Fuel Company, Main Street, Loudonville, Ohio.

Richardson, G. B. .....May 19, 1908
Manager, Altoona Gas Company, Altoona, Kansas.

Roberts, C. C. .....May 18, 1909
Foreman, Clarion Gas Company, Butler, Pennsylvania.

Robinson, George .....May 17, 1910
Oil Operator, Wayne Oil & Gas Company, Independence, Kansas.

Rodgers, Edward H. .....May 19, 1908
President, The Standard Meter Company, 3112 North 17th Street, Philadelphia, Pennsylvania.

Rodgers, W. J. .....May 18, 1909
General Superintendent, Field Department, The Columbia Gas & Electric Company, Huntington, West Virginia.

Rogers, H. R. .....May 18, 1909
Superintendent, The Newark Natural Gas & Fuel Company, 518 N. Fourth Street, Newark, Ohio.

Rogers, Julius .....May 18, 1909
Chief Engineer, The Ohio Fuel Supply Company, Homer, Ohio.

Rooney, E. S. .....May 18, 1909
District Sales Agent, The Youngstown Sheet and Tube Company, 2420 Farmers Bank Building, Pittsburg, Pennsylvania.

Rose, H. A. .....June 12, 1906
Superintendent, The Ft. Scott Gas & Electric Company, Ft. Scott, Kansas.

Russum, R. C. .....May 19, 1908
Cashier, The Webb City-Cartersville Gas Company, 25 South Webb Street, Webb City, Missouri.

Sands, Louis C. .....May 18, 1909
Vice President, The Oil Well Supply Company, 215 Water Street, Pittsburg, Pennsylvania.

de Saules, C. A. H. .....May 19, 1908
President, The Tulsa Fuel & Mfg. Company, 1 Michigan Avenue, Iola, Kansas.

Schatzel, George P. .....May 18, 1909
Agent, The Logan Natural Gas & Fuel Company, 107 South Main Street, Findlay, Ohio.

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Schell, George W. .....May 17, 1910
Chief Engineer, The Mohican Oil & Gas Company, Howard, Ohio.

Schellhammer, A. L. .....May 19, 1908
Pennsylvania Furnace & Stove Company, Warren, Pennsylvania.

Schwarm, C. A. .....May 21, 1907
General Superintendent, The National Gas, Electric Light & Power Company, 402 Union Trust Building, Detroit, Michigan.

Scott, G. C. .....May 18, 1909
Secretary-Treasurer, The Columbus Gas & Fuel Company, 135 North Front Street, Columbus, Ohio.

Scott, John M. .....May 18, 1909
Auditor, McGowan, Small & Morgan, Grantees, 908 Grand Avenue, Kansas City, Missouri.

Sears, Clifton W. .....February 27, 1906
Superintendent, Consumers Light and Heating Company, East Third Street, Fort Worth, Texas.

Seeger, Robert .....May 21, 1907
District Manager, The Welsbach Street Lighting Company of America, 712 Roe Building, St. Louis, Missouri.

Shannon, O. K. .....May 17, 1910
Secretary, Consumers Light & Heating Company, Ft. Worth, Texas.

Shaw, Wilson A. .....May 18, 1909
Director, The Kansas Natural Gas Company, Bank of Pittsburg, Pittsburg, Pennsylvania.

Shepard, W. H. .....May 19, 1908
Secretary, Coffeyville Gas & Fuel Company, Coffeyville, Kansas.

Shiebler, Marvin .....May 17, 1910
Gas Engineer, 30 Church Street, New York, New York.

Shreve, J. H. .....February 27, 1906
Manager, The Hutchinson & Newton Gas Company, Hutchinson, Kansas.

Shryock, George A. .....February 27, 1906
Ouapan Gas Company, Bartlesville, Oklahoma.

Sigler, B. N. .....May 18, 1909
Leasehold Department, The Logan Natural Gas & Fuel Company, 34 Ruggery Building, Columbus, Ohio.

Sinclair, E. W. .....May 21, 1907
General Manager, The Wellington Gas Company, Independence, Kansas.

Sipe, George B. .....May 19, 1908
Manager, the Louisiana Gas Company, 616 Market Street, Shreveport, Louisiana.

Sladden, W. K. .....May 18, 1909
Auditor and Assistant Secretary, Columbia Gas & Electric Company, First National Bank Building, Cincinnati, Ohio.

Sloan, J. A. .....May 21, 1907
American Gas Company, Columbus, Kansas.

Small, H. G. .....May 17, 1910
Superintendent, The Kansas Natural Gas Company, 511 East Myrtle Street, Independence, Kansas.

Smith, E. B. .....May 18, 1909
Secretary, The Coshocton Gas Company, 603 Main Street, Coshocton, Ohio.

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Smith, John W. .....May 18, 1909
President, The Columbus (Ohio) Natural Gas Company, Muncie, Indiana.

Snyder, R. M., Jr. .....March 20, 1906
Director, Kansas Natural Gas Company and Caney Gas Company, 316 American Bank Building, Kansas City, Missouri.

Sparkes, G. F. .....May 19, 1908
904 East 12th Street, Kansas City, Missouri.

Spettigue, J. T. .....May 19, 1908
General Inspector, The Kansas Natural Gas Company, 918 Pennsylvania Avenue, Kansas City, Missouri.

Spicer, B. F. .....May 18, 1909
Agent, The Logan Natural Gas & Fuel Company, West Perry Street, Bucyrus, Ohio.

Springer, Edward S. .....February 27, 1906
Manager, Leavenworth Light & Heating Company, 518 Delaware Street, Leavenworth, Kansas.

Stamm, D. M. .....May 19, 1908
Superintendent, The Caney Gas Company, and Caney Gas Oil and Mining Company, 307 South High Street, Caney, Kansas.

Stamford, G. T. .....May 17, 1910
Attorney, The Wichita Natural Gas Company, Independence, Kansas.

Stark, L. H. .....May 19, 1908
Superintendent, The Union Gas & Traction Company, Merriam, Kansas.

Stewart, S. B. .....May 17, 1910
General Contracting Agent, Philadelphia Company, 435 Sixth Street, Pittsburg, Pennsylvania.

Stevenson, Barton .....May 18, 1909
Selling Engineer, The Westinghouse Machine Company, 500 Westinghouse Building, Pittsburg, Pennsylvania.

Stinson, J. H. .....May 19, 1908
General Inspector, The Kansas Natural Gas Company, 918 Pennsylvania Avenue, Kansas City, Missouri.

Stone, Frederick W. .....May 21, 1907
Manager, Ashtabula Gas Company, 170 East Main Street, Ashtabula, Ohio.

Storm, J. C. .....May 17, 1910
President, The Amarillo Gas Company, 403 Tayler Street, Amarillo, Texas.

Stotler, R. M. .....May 18, 1908
Traveling Salesman, The Pittsburg Meter Company, 6 East 11th Street, Kansas City, Missouri.

Stoughton, William D. .....May 18, 1909
Superintendent, North Field, The Columbus Gas & Fuel Company, R. F. D. No. 3, Centerburg, Ohio.

Strickler, James P. .....May 21, 1907
Superintendent, The Columbus Gas & Fuel Company, 135 North Front Street, Columbus, Ohio.

Stuchell, F. L. .....June 12, 1906
Manager, The Wellington Gas Company, 208 South Washington Avenue, Wellington, Kansas.

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Stuntz, R. M. .....May 19, 1908
Division Superintendent, Kansas Natural Gas Company, Lock Box 8, Weston, Missouri.

Swan, G. J. .....May 18, 1909
Superintendent, Consumers Light, Heat & Power Company, 214 East First Street, Topeka, Kansas.

Sweetman, M. M. .....February 27, 1906
Superintendent, Kansas Natural Gas Company, 316 American Bank Building, Kansas City, Missouri.

Swift, Justin R. .....May 18, 1909
Representative, The Westinghouse Machine Company, 500 Westinghouse Building, Pittsburg, Pennsylvania.

Tanner, C. L. .....May 18, 1909
General Gas Inspector, The Logan Natural Gas & Fuel Company, 473 West Main Street, Newark, Ohio.

Tewksbury, J. B. .....May 18, 1909
Commercial Manager, The Union Gas & Electric Company, Fourth and Plum Streets, Cincinnati, Ohio.

Thompson, Paul .....May 17, 1910
Assistant to 3rd Vice President, The United Gas Improvement Company, Broad & Arch Streets, Philadelphia, Pennsylvania.

Tidball, J. W. .....May 17, 1910
Superintendent, The Ohio Fuel Supply Company, 5229 Rose Avenue, Norwood, Ohio.

Tidnam, F. H. .....May 17, 1910
Manager, Oklahoma Gas & Electric Company, Oklahoma City, Oklahoma.

Tippett, W. H. .....May 19, 1908
Auditor's Office, Kansas Natural Gas Company, 815 Farmers Bank Building, Pittsburg, Pennsylvania.

Tippy, C. W. .....May 17, 1910
General Manager, The Dallas Gas Company, 411 Commerce Street, Dallas, Texas.

Town, H. L. .....May 18, 1909
Salesman, The Lindsay Light Company, 173 Norwich Avenue, Columbus, Ohio.

Townsend, Charles W. .....May 19, 1908
Secretary, The Chaplin-Fulton Mfg. Company, 34 Penn Avenue, Pittsburg, Pa. .....

Treleaven, L. G. .....May 21, 1907
Secretary and Manager, Consumers Light, Heat & Power Company, 824 Kansas Avenue, Topeka, Kansas.

Trimble, G. W. .....May 18, 1909
Superintendent, City Natural Gas Plant, 416 North Columbus Street, Lancaster, Ohio.

Turney, Henry D. .....May 18, 1909
President, The Columbus Gas & Fuel Company, 135 North Front Street, Columbus, Ohio.

Uhler, A. S. .....May 18, 1909
Mechanical Engineer, Ingersoll-Rand Company, 1226 Farmers Bank Building, Pittsburg, Pennsylvania.

Upham, D. A. .....May 18, 1909
President, Upham Gas Company and Aleco Oil & Gas Company, 606 Union Trust Building, Parkersburg, West Virginia.

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VanBlarcom, Howell .....May 18, 1909
Manager, Pittsburg District, Westinghouse Machine Company, 500 Westinghouse Building, Pittsburg, Pennsylvania.

Van Sickle, Charles .....May 17, 1910
Manager, Arkansas & Territorial Oil & Gas Company, 516 North "A" Street, Fort Smith, Arkansas.

Van Sickle, Walter S. .....May 17, 1910
Superintendent, Arkansas & Territorial Oil & Gas Company, 516 North "A" Street, Fort Smith, Arkansas.

Wallace, R. D. .....May 21, 1907
Agent, The Kansas Natural Gas Company, Sixth and Maple Streets, Independence, Kansas.

Walsh, M. W. .....February 27, 1906
Superintendent of Gas Department, Oklahoma Gas & Electric Company, 110 North Broadway, Oklahoma City, Oklahoma.

Watkins, C. P. .....May 19, 1908
Agent, The Tate-Jones Company, Pittsburg, Pennsylvania.

Watts, T. B. .....May 21, 1907
Appliance Manufacturer, 920 Garfield, Kansas City, Missouri.

Way, William B. .....May 18, 1909
District Manager, The Ludlow Valve Manufacturing Company, 2022 Farmers Bank Building, Pittsburg, Pennsylvania.

Weart, Spencer S. .....May 18, 1909
Vice President and General Manager, Sun Vapor Street Light Company, 1000 South Market Street, Canton, Ohio.

Weaver, A. J. .....May 18, 1909
President, South Liberty Oil & Fuel Company, Basil, Ohio.

Weaver, S. D. .....May 18, 1909
Leasing Department, The Logan Natural Gas & Fuel Company, 1228 East Main Street, Columbus, Ohio.

Weisgerber, E. C. .....May 17, 1910
Manager and Secretary, The Zanesville Gas Light Company, North 6th Street, Zanesville, Ohio.

Welch, J. S. .....February 27, 1906
The United Gas Improvement Company, Broad & Arch Streets, Philadelphia, Pennsylvania.

Welch, William McNair .....February 27, 1906
Superintendent and Chief Engineer, The Kansas Natural Gas Company, Independence, Kansas.

Westcott, H. P. .....May 21, 1907
Metric Metal Works, Erie, Pennsylvania.

Whitcomb, E. P. .....May 18, 1909
Vice President and General Manager, The Union Natural Gas Corporation, Farmers Bank Building, Pittsburg, Pennsylvania.

White, Archibald A. .....May 18, 1909
President, The Columbia Gas & Electric Company, White & Company, 25 Pine Street, New York, New York.

White, R. W. .....May 18, 1909
Assistant to the President, The Columbia Gas & Electric Company, First National Bank Building, Cincinnati, Ohio.

Whitehead, L. K. .....June 12, 1906
Texarkana Gas & Electric Company, 116 East Broad Street, Texarkana, Arkansas.

Whysall, George .....May 18, 1909
Gas Engineer, Marion, Ohio.

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Wigton, C. Benson .....May 18, 1909
Engineer and Draughtsman, Kansas Natural Gas Company, Independence, Kansas.

Willey, C. L. .....May 17, 1910
Secretary-Treasurer, Bellevue Gas & Oil Company, Independence, Kansas.

Williams, H. O. .....June 12, 1906
Disbursing Agent, The Kansas Natural Gas Company, 110 East Maple Street, Independence, Kansas.

Willoughby, Horace .....May 18, 1909
Salesman, Scioto Valley Supply Company, Third and Long Streets, Columbus, Ohio.

Wilson, C. F. .....May 21, 1907
South-Western Supply Company, Kansas City Missouri.

Wilson, E. D. .....June 12, 1906
Manager, Emporia Gas Company, Emporia, Kansas.

Wineland, J. H. .....May 18, 1909
Agent, The Logan Natural Gas & Fuel Company, Clyde, Ohio.

Wise, C. B. .....May 21, 1907
Salesman, The National Supply Company, Independence, Kansas.

Witman, A. C. .....May 18, 1909
President, The Peerless Stove & Range Company, 236 North Water Street, Columbus, Ohio.

Witman, W. S. .....May 18, 1909
Salesman, The Peerless Stove & Range Company, 236 North Water Street, Columbus, Ohio.

Wittmer, George X. .....May 19, 1908
Assistant Secretary and Treasurer, American Natural Gas Company, 407 Park Building, Pittsburg, Pennsylvania.

Wittmer, Henry .....May 18, 1909
Secretary, American Natural Gas Company, 407 Park Building, Pittsburg, Pennsylvania.

Wittmer, Thomas .....May 17, 1910
Superintendent, American Natural Gas Company, 6113 Jackson Street, Pittsburg, Pennsylvania.

Wittmer, Xavier .....May 19, 1908
President, The American Natural Gas Company, 407 Park Building, Pittsburg, Pennsylvania.

Wonderley, W. V. .....May 18, 1909
Chief Engineer, The Logan Natural Gas & Fuel Company, Bangs, Ohio.

Wood, C. M. .....May 19, 1908
Water Supply Engineer, Santa Fe Railroad, Amarillo Hotel, Amarillo, Texas.

Wood, W. L. .....May 17, 1910
Manager, The Texarkana Gas & Electric Company, 116 East Broad Street, Texarkana, Texas.

Worth, A. .....May 21, 1907
Manager, The Worth Machinery Company, Joplin, Missouri.

Worth, S. S. .....May 21, 1907
Superintendent, The Worth Machinery Company, Joplin, Missouri.

Young, James .....February 27, 1906
Manager, The London Gas Company, London, Ontario, Canada.

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Zitzewitz, Herman .....May 19, 1908
President, The National Machine Works, 10 Sheffield Avenue, Chicago, Illinois.

ASSOCIATE MEMBERS.

Brendingler, W. B. .....May 17, 1910
Pittsburg Manager, Ingersoll-Rand Company, Farmers Bank Building, Pittsburg, Pennsylvania.

Cavenaugh, Frank .....May 17, 1910
Salesman, The Maryland Meter Company, 1811 Peoples Gas Building, Chicago, Illinois.

Chaplin, William C. .....May 17, 1910
Treasurer, The Chaplin-Fulton Mfg. Company, 34 Penn Avenue, Pittsburg, Pennsylvania.

Corbett, M. A. .....May 17, 1910
Secretary, The Corbett-Stevens Company, 391 West Spring Street, Columbus, Ohio.

Ellis, Walker .....May 17, 1910
Salesman, The F. W. Heitman Company, Houston, Texas.

Evans, George W. .....May 17, 1910
Vice President, The Squarelite Mfg. Company, 133 South Akard, Dallas, Texas.

Fisher, James P. .....May 17, 1910
Manager Kansas Office, The Hope Engineering & Supply Company, 1011 New York Life Building, Kansas City, Missouri.

Fithian, E. J. .....May 17, 1910
Treasurer, The Bessemer Gas Eng. Company, Lincoln Avenue, Grove City, Pennsylvania.

Fulton, Louis B. .....May 17, 1910
President, The Chaplin-Fulton Mfg. Company, 34 Penn Avenue, Pittsburg, Pennsylvania.

Hackstaff, Richard C. .....May 17, 1910
Superintendent, The Hope Engineering & Supply Company, 803 Farmers Bank Building, Pittsburg, Pennsylvania.

Hardcastle, J. D. .....May 17, 1910
Manager, Spang Chalfant & Company, Inc. St. Louis, Missouri.

Harper, J. D. .....May 17, 1910
President, The Texas Machinery & Supply Company, Dallas, Texas.

Holt, W. T. .....May 17, 1910
Proprietor, The Kansas City Developing & Mfg. Company, 1710 Walnut Street, Kansas City, Missouri.

Johnson, Arthur B. .....May 17, 1910
Representative, The Westinghouse Machine Company, 1119 Chemical Building, St. Louis, Missouri.

Keeton, C. J. .....May 17, 1910
Proprietor, The Kansas City Developing & Mfg. Company, 1710 Walnut Street, Kansas City, Missouri.

Larkin, J. J. .....May 17, 1910
Larkin Brothers, Bartlesville, Oklahoma.

Mason, Sidney .....May 17, 1910
President, The Welsbach Company, Broad & Arch Streets, Philadelphia, Pennsylvania.

McKee, William .....May 17, 1910
Auditor, The Chaplin-Fulton Mfg. Company, 34 Penn Avenue, Pittsburg, Pennsylvania.

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Moore, Edgar M. .....May 17, 1910
Edgar M. Moore & Company, 914 Farmers Bank Building, Pittsburg, Pennsylvania.

O'Neill, William D. .....May 17, 1910
Secretary and Treasurer, The Oil & Gas Journal, Tulsa, Oklahoma.

Reynolds, M. G. .....May 17, 1910
Sole Owner, The Reynolds Gas Regulator Co., 1609 Jackson Street, Anderson, Indiana.

Rhea, E. B. .....May 17, 1910
Sales Manager, The Snow Steam Pump Company, 827 Scarrett Building, Kansas City, Missouri.

Robinson, Forster .....May 17, 1910
The Robinson Uniform Compression Coupler Company, Casey, Illinois.

Robinson, George W. .....May 17, 1910
Salesman, The Ingersoll-Rand Drill Company, 1007 Fullerton Building, St. Louis, Missouri.

Schall, Henry D. .....May 17, 1910
Gas Appliance Department, Detroit Stove Works, 2921 La Salle Street, Chicago, Illinois.

Seidenglanz, C. H. .....May 17, 1910
Representative, General Gas Light Company, 1620 East 8th Street, Kansas City, Missouri.

Sprague, H. H. .....May 17, 1910
President, Sprague Meter Company, 205 Water Street, Bridgeport, Connecticut.

Strickler, W. W. .....May 17, 1910
The Robinson Uniform Compression Coupler Company, Muskogee, Oklahoma.

Sybrandt, John L. .....May 17, 1910
District Manager, The Ludlow Valve Manufacturing Company, 503 Victor Building, Kansas City, Missouri.

JUNIOR MEMBERS.

Atherton, G. R. .....June 12, 1906
Kansas Natural Gas Company, Purcell, Missouri.

Carpenter, J. F. .....May 21, 1907
Assistant Superintendent, Kansas Natural Gas Company, Joplin, Missouri.

Dodds, C. J. .....June 12, 1906
Cashier, The Citizens Light, Heat & Power Company, 5 East Henry Street, Lawrence, Kansas.

Enright, Edward A. .....March 20, 1906
Gas Fitting & Plumbing, 917 Frederick Avenue, St. Joseph, Missouri.

Enright, P. K. .....May 19, 1908
Superintendent, St. Joseph Gas Company, St. Joseph, Missouri.

Ewers, Frank .....May 21, 1907
Superintendent, Kansas Natural Gas Company, Chitwood, Missouri.

Goddard, W. S. .....June 12, 1906
Superintendent, The Kansas Natural Gas Company, Joplin, Missouri.

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Hackstaff, John D. .....June 12, 1905
Superintendent and Engineer, The Hope Engineering & Supply Company, 803 Farmers Bank Building, Pittsburg, Pennsylvania.

Hunt, Edwin .....May 21, 1907
Superintendent, The Kansas Natural Gas Company, Joplin, Missouri.

Keenan, J. E. .....May 19, 1908
Superintendent, 2308 Main Street, Sharpsburg, Pennsylvania.

Markus, O. G. F. .....May 21, 1907
Manager, The Shawnee Gas Company, Shawnee, Oklahoma.

Mason, C. F. .....May 21, 1907
Agent, The Oronogo Gas Company, 201 Nevada Street, Oronogo, Missouri.

McDonald, W. A. P. .....May 21, 1907
Vice President, St. Joseph Gas Company, St. Joseph, Missouri.

McPhail, D. .....May 19, 1908
Superintendent, The Kansas Natural Gas Company, Joplin, Missouri.

Powell, C. A. .....May 19, 1908
Superintendent, St. Joseph Gas Company, Eighth and Francis Streets, St. Joseph, Missouri.

Stewart, Clark D. .....May 21, 1907
Manager, Carl Junction Gas Company, Carl Junction, Missouri.

Truscott, H. J. .....May 21, 1907
Agent and Foreman, The Mohican Oil and Gas Company, Loudonville, Ohio.

Ward, J. M. .....May 19, 1908
Superintendent, The Kansas Natural Gas Company, Joplin, Missouri.

Welch, J. Robert .....May 21, 1907
General Inspector, Kansas Natural Gas Company, Independence, Kansas.

White, Thomas .....June 12, 1906
The Oil Well Supply Company, Independence, Kansas.

Williamson, J. F. .....May 21, 1907
Superintendent, The Kansas Natural Gas Company, Joplin, Missouri.

SUMMARY OF CLASSES OF MEMBERSHIP.

Honorary Members	5
Active Members	407
Associate Members	29
Junior Members	21
Total	462

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Galena	H. McLaughlin.
Garnett	Joseph Carey.
	J. F. Lawrence.
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Hutchinson	John A. Greenert.
	J. H. Shreve.
Independence	Hugh P. Brawley.
	H. R. Davis.
	R. E. Eakin.
	Thomas Gavin.
	C. A. Gibson.
	David Green.
	R. J. Guillan.
	W. C. Henry.
	W. J. Hurley.
	W. J. Keating.
	E. J. Lambert.
	J. M. Landon.
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	Alexander B. Macbeth.
	C. F. Mahan.

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	H. G. Small.
	G. T. Stamford.
	R. D. Wallace
	Robert Welch.
	William McNair Welch.
	Thomas White.
	A. Benson Wigton.
	C. L. Willey.
	H. O. Williams.
	C. B. Wise.
Iola	E. C. Champion.
	F. J. Horton.
	C. A. H. de Saules.
Kansas City	J. W. Dana.
	Thomas E. C. Lloyd.
	William H. McKenzie.
Lawrence	Edgar H. S. Bailey.
	C. J. Dodds.
	J. H. Dunkel.
	Erasmus Haworth.
Leavenworth	Edward S. Springer.
Merriam	W. L. Pattison.
	L. H. Stark.
Mound Valley	F. M. Gillmore.
Ottawa	I. W. King.
Parsons	Charles D. Bell.
	H. W. Raber.
Pittsburg	J. H. Carter.
	T. F. Cole.
	M. C. Kelly.
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Covington	J. C. Ernst.

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	S. S. Hunter.
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	R. W. McIlvain.
	George B. Sipe.

Maryland

Cumberland	J. D. Northrup.

Michigan

Detroit	J. M. Harley.
	James T. Lynn.
	C. A. Schwarm.
Kalamazoo	J. J. Knight.

Missouri

Carl Junction	Clark D. Stewart.
Carthage	J. S. Connolly.
	O. J. McLane.
Chitwood	Frank Ewers.
Joplin	E. L. Baker.
	W. P. Benedict.
	C. L. Bullock.
	J. F. Carpenter.
	B. J. Crahan.
	C. B. Craig.
	William Fowks.
	W. S. Goddard.
	Edwin Hunt.
	T. C. Malloy.
	D. McPhail.
	J. M. Ward.
	J. F. Williamson.
	A. Worth.
	S. S. Worth.

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Missouri — Continued.

Kansas City	Louis Benditt.
	Harry Branch.
	R. B. Cannon.
	F. J. Coyle.
	James P. Fisher.
	R. O. Fritz.
	F. W. Higgins.
	W. T. Holt.
	T. B. Jarvis.
	W. L. Jones.
	Hans Carl Jurgensen.
	C. J. Keeton.
	J. A. Kerr.
	R. L. Kidner.
	S. J. Mattocks.
	C. F. Mead.
	Lee B. Mettler.
	Eugene Metz, Jr.
	J. C. Osborn.
	William Ostermaier.
	C. H. Pattison.
	J. H. Ransom.
	E. B. Rhea.
	John M. Scott.
	C. H. Seidenglanz.
	R. M. Snyder.
	G. F. Sparkes.
	J. T. Spettigue.
	J. H. Stinson.
	R. M. Stotler.
	M. M. Sweetman.
	John L. Sybrandt.
	T. B. Watts.
	C. F. Wilson.
Oronogo	D. D .Malloy.
	C. F. Mason.
Purcell	G. R. Atherton.
Springfield	W. A. Bixby.
St. Joseph	D. M. Coughlin.
	Edward A. Enright.
	P. K. Enright.
	F. Labrunerie.
	W. A. P. McDonald.
	Kerr Murray Mitchell.
	C. A. Powell.

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St. Louis	J. D. Hardcastle.
	Arthur B. Johnson.
	George A. Robinson.
	Robert Seegar.
Webb City	George H. Bruen.
	Charles O'Neil.
	R. C. Russum.
Weston	R. M. Stuntz.

Montana

Billings	John L. Mann.

New Jersey

Gloucester City	T. J. Little, Jr.
	Alphonso Mason.

New York

Buffalo	Stewart Babbitt.
	A. E. Ballin.
Corning	George S. Goff.
	W. M. Gurnsey.
Honeoy Falls	A. B. Kellogg.
New York	Chester T. Ayers.
	A. S. Cody.
	Henry L. Doherty.
	Alanson P. Lathrop.
	J. Alexander Mayer.
	Emerson McMillin.
	Marvin Shiebler.
	Archibald A. White.

Ohio

Alliance	A. H. Moore.
	L. R. Potter.
Ashtabula	F. W. Stone.
Bangs	W. V. Wonderley.
Basil	A. J. Weaver.
Bucyrus	B. F. Spicer.
Canton	Spencer S. Weart.
Centerburg	William D. Stoughton.
Chillicothe	W. C. Dunlap.
	Charles W. Morgan.

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	James M. Hutton.
	George W. Galbraith.
	W. C. Gill.
	J. D. Lyon.
	William A. Miller.
	W. K. Sladden.
	J. B. Tewksbury.
	R. W. White.
Cleveland	C. H. Beardslee.
	Martin B. Daly.
	A. L. Gassett.
	W. H. Knight.
	George J. Leber.
Clyde	J. H. Wineland.
Columbus	P. A. Alberty.
	S. S. Allen, Jr.
	John Adams Bownocker.
	W. J. Broder.
	Frank L. Chase.
	M. A. Corbett.
	Henry Coyle.
	Fred. W. Crawford.
	D. Friedenberg.
	John M. Garard.
	Charles E. Hammack.
	Judson Harmon.
	James Kosson
	Kay C. Krick.
	Alan Leamy.
	Preston W. Lupher.
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Croton	H. R. P. Miller.
Dayton	W. W. Price.
Delaware	Thomas Clive Jones.
Elyria	William M. Adams.
Findlay	George E. Armbuster.
	George P. Schatzel.
Fremont	R. L. Hottinger.
	Albert Howe.
	Elmer Loveland.
Granville	Thomas M. Kier.
Homer	Julius Rogers.
Howard	George W. Schell.
Junction City	M. S. Lupher.
Lancaster	H. M. Anderson.
	J. C. Dallior.
	A. LaCroix.
	C. A. Lupher.
	James Murtaugh.
	G. W. Trimble.
Lima	J. D. S. Neely.
Lorain	S. A. Ault.
Loudonville	J. D. Renick.
	H. J. Truscott.
Mansfield	S. M. Douglas.
Marietta	B. G. Dawes.
	C. W. Lemon.
Marion	Robert H. Higgins.
	M. A. Mickley.
	George Whysall.
Middletown	G. N. Clapp.
Newark	Joseph Duke.
	H. R. Rogers.
	Frederick Ewing.
	C. L. Tanner.
Norwood	J. W. Tidball.
Springfield	E. D. Abbott.
St. Marys	Philip Dixon.
	Lemon Neely.
Toledo	J. W. McMahon.
Zanesville	E. C. Weisgerber.

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Oklahoma

Ardmore	P. C. Dings.
	H. B. Goodrich.
Bartlesville	J. F. Allen.
	Frank F. Finney.
	Paul R. Johnson.
	George Shryock.
	J. J. Larkin.
Blackwell	E. A. Gillespie.
Bristow	Frank Barnes.
Claremore	L. E. Cozzins.
Guthrie	W. J. Dibbens.
Muskogee	H. C. Hoagland.
	J. F. Owens.
	W. W. Strickler.
Norman	Charles Newton Gould.
Ochelata	A. Hudson.
Oklahoma City	Harry C. Nilson.
	F. H. Tidnam.
	M. W. Walsh.
Sapulpa	C. C. Cantrell.
Shawnee	O. G. F. Markus.
Tulsa	D. Hasting.
	A. M. Leanard.
	William D. O'Neill.

Pennsylvania

Bradford	George P. Boothe.
	Z. B. Custer.
	George F. Groves.
	R. J. Hoffman.
	Fred A. Miller.
Brookville	F. C. Deemer.
Butler	W. H. Larkin.
	C. C. Roberts.
East Pittsburg	A. G. Holmes.
Erie	Otto G. Hitchcock.
	N. H. Nicholson.
	H. P. Westcott.
Greenville	A. C. Hartzell.
Grove City	John Carruthers.
	E. J. Fithian.
	George Barrows.

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Pennsylvania — Continued.

Philadelphia	John H. Blye.
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	Ernest L. Brundett.
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	G. W. Curran.
	Thomas Dolan.
	W. F. Douthirt.
	C. Willing Hare.
	R. C. James.
	John Bartleman Klumpp.
	Lewis Lillie.
	Sidney Mason.
	John D. McIlhenny.
	Randall Morgan.
	Rollin Norris.
	Edward H. Rodgers.
	Paul Thompson.
	J. S. Welch.
Pittsburg	A. A. Armstrong.
	Charles R. Ballard.
	George W. Barnes.
	Theodore N. Barnsdall.
	E. L. Bartley.
	Arthur Boothe.
	Glenn T. Braden.
	W. B. Brendingler.
	George R. Brink.
	D. J. Brown.
	Wm. C. Chaplin.
	W. F. Corcoran.
	George W. Crawford.
	A. B. Daily, Jr.
	J. H. Diamond.
	Alfred J. Diescher.
	D. M. Donehue.
	S. Eibenschutz.
	F. P. Fisher.
	Louis B. Fulton.
	E. H. Gwynn.
	J. D. Hackstaff.
	Richard C. Hackstaff.
	W. R. Hadley.

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Pittsburg — Concluded.

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Ralph W. Hay.
Victor A. Hays.
George Heard.
H. D. Hilderbrand.
David O. Holbrook.
H. J. Hoyt.
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Robert J. Lindsay.
R. S. Lord.
J. C. McDowell.
William McKee.
W. E. Messenger.
Fred W. Miner.
Edgar M. Moore.
Robert Munro.
William M. Patterson.
William S. Ralston.
H. C. Reeser.
E. S. Rooney.
Louis C. Sands.
Wilson A. Shaw.
S. B. Stewart.
Barton Stevenson.
Justin R. Swift.
W. H. Tippett.
Charles W. Townsend.
A. S. Uhler.
Howell Van Blarcom.
C. P. Watkins.
William B. Way.
E. P. Whitcomb.
George X. Wittmer.
Henry Wittmer.
Thomas Wittmer.
Xavier Wittmer.

Sharpsburg ..... Henry E. LeFevre.
J. A. Keenan.

Warren ..... A. L. Schellhammer.

Waynesburg ..... C. E. Ditman.

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Kentucky	2	West Virginia	7
Louisiana	8	Ontario, Canada	4
Maryland	1	Holland	1
Michigan	4		
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Montana	1		

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